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Improved System of Rolling Car Wheels.

Wrought iron, from its nature, is better adapted to withstand sudden shocks and jars than cast iron, and is therefore specially fitted for car wheels and similar details of machinery which require to be light and strong. The system shown herewith is designed to turn out wrought-iron car wheels, or bands of wrought iron of similar shape for other purposes, such as tires, hoops for cannon, etc. The system includes both rolling and hammering the work, the two methods being identical, or performed at the same time. The engraving is not taken from a working machine but from a model; this explanation is necessary from the shape of some of the parts, which would of course be changed in the machine itself.

Fig. 1 represents the plan of the machine. In it the shaping rollers, A, are shown acting on the work or wheel, B.

This wheel is shown already done. It was previously a plain flat sheet of metal, set, while hot, between two revolving clamps C. The shape of the clamps is shown by the dotted lines. As the rollers, A, revolved, they acted on the thin projecting edge of the plate, turned the same over, and in due course formed it up as shown. There are two sets of forming rollers, both alike, except that those marked A are capable of being moved up toward the work by the hand wheel, D, and carriage, E. This is necessary in order to follow up the plate as it is turned over. The train of gears which drives the rollers is shown at F.

The plate while being rolled rests on the anvil roller, G, Fig. 2, and a tilt hammer is set over the wheel, and acts on the same as it rotates. In this way it is claimed that a perfect wheel can be produced, the metal being consolidated as in the best forgings. By the same principle cannon may be rolled and hammered, conical rollers being substituted, and the hammer employed as usual.

The hammer may be shoved one side out of the way when necessary so it will not conflict with other operations. Single or double-plated wheels, cylinders for boilers or casks, can and spinner rings for factories, in fact, all kinds of circular forging, can be performed on this anvil.

It is a great improvement in this system of rolling to employ the hammer, as, if properly used, the work will be undeniably better than where it is not used.

It was patented on Jan. 6, 1863, by Samuel Vanstone. For further information address him, care Providence Tool Co., at North Providence, R. I.

Fig. 1

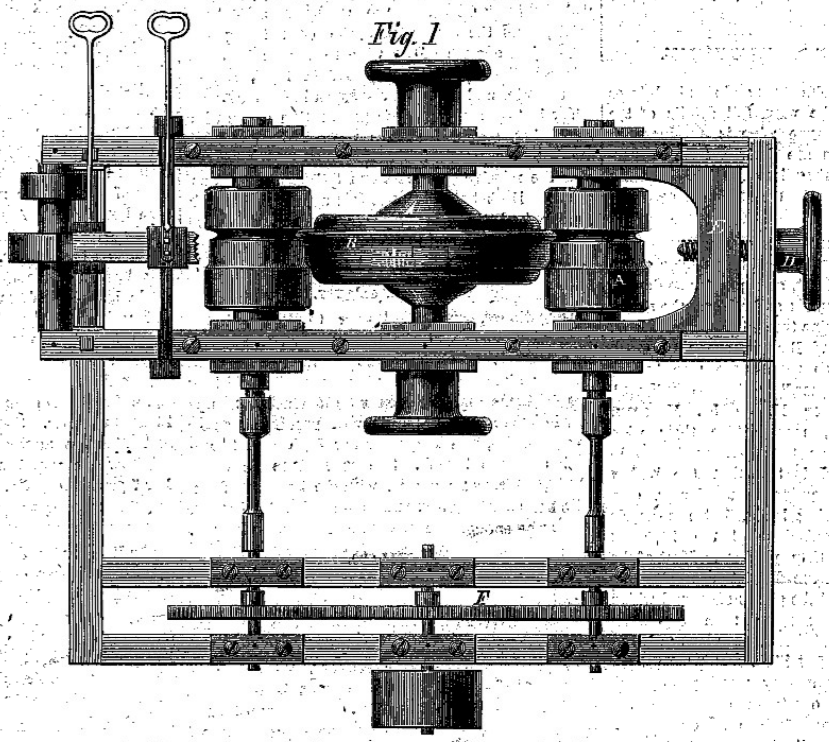
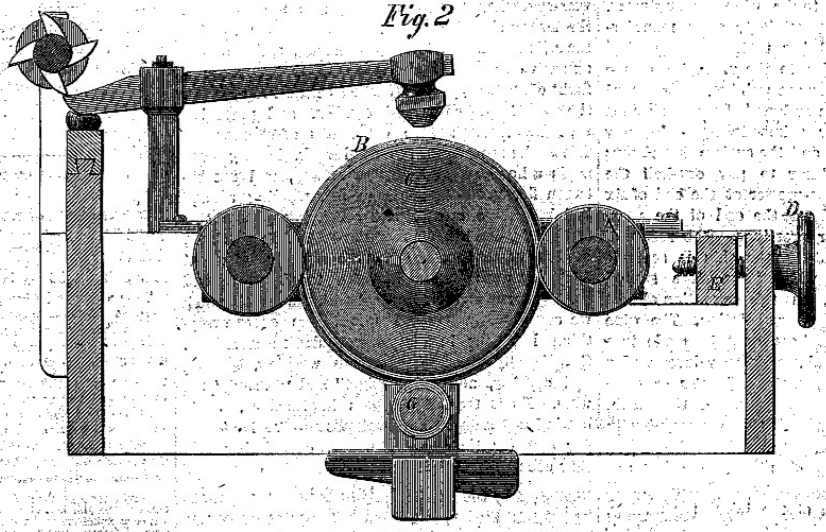


Fig. 2



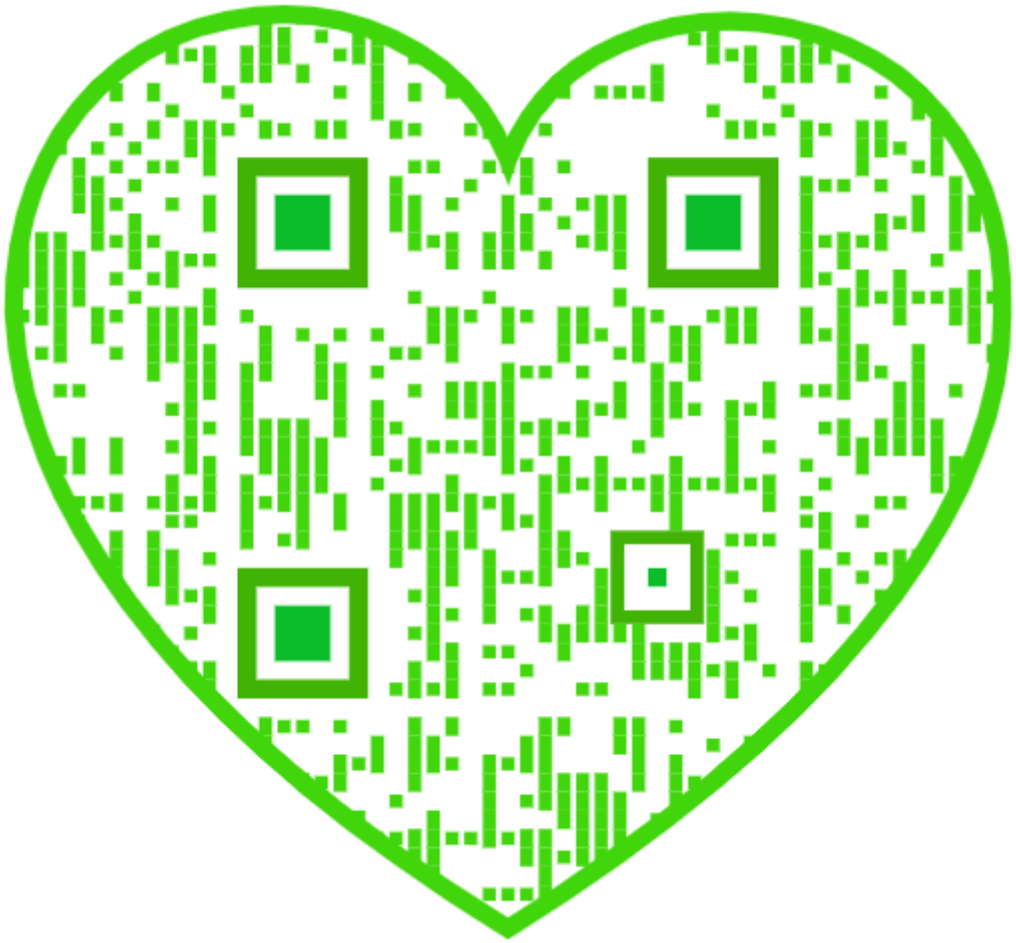
VANSTONE'S SYSTEM OF ROLLING CAR WHEELS.

Thousands of rails on the Weldon (N. C.) Railroad are lying along the roadside in the shape of a right angle, and many are still left coiled around the trees.

Manufacturing and Tempering Sword Blades in India.

The swords, manufactured in the Regency of Cutch, an English province in Eastern Asia, have long since been celebrated in India for their wonderful strength and enduring edge. The following description of their mode of manufacture was communicated to the British public, some years since, by an English army officer who had long held a military command in that province, and who had an opportunity of learning the process of manufacture and tempering employed in producing those wonderful blades.

An inch bar of fine English or Swedish steel is first forged out into plates seven inches long by one inch broad, and one-sixth of an inch thick. Similar bars of very fine soft iron are then prepared in the same manner. These pieces of forged steel and iron are smeared over with a paste of borax, dissolved in water, and laid up in piles of between nine of steel to three of iron, alternately; each pile is then wrapped around with thickly plastered mud, made of a loamy earth; then heated, welded, and drawn out to a bar of one inch and one-eighth broad, and one-third of an inch thick. This is bent over itself three or four times, and again welded and drawn out to half an inch in thickness, and during the heat borax is frequently dropped on the metal while in the fire. Two or three bars of this metal thus prepared are next welded into one, and when about twelve or fourteen inches long, is bent into the form of a staple; in the middle of this piece a fine-grained file is now inserted, of the same width and nearly as thick as the bent bar; all is now welded together, and the blade then formed. In tempering, an earthen pot, twelve inches wide and six deep, is notched on the edge, the notches being opposite to each other. The notching is done with a file, and about a quarter of an inch deep. The pot is now filled nearly up to the notches with water, and oil is then poured upon the



surface. The sword blade being heated equally to a light red heat, is removed from the fire, and the point entered into the notch on one edge is passed across the surface of the oil and water to the opposite notch, keeping the edge from a quarter to half an inch in the oil; the blade is thus drawn backward and forward rather slowly till the hissing ceases, and the rest of the blade above the fluid has become black; a jug of water, without oil, is then poured along the blade, from heel to point. In order to take out the warp produced by tempering, the blade, when nearly cold, is passed over the fire three or four times, then placed again upon the anvil, and set straight, by striking it regularly, but moderately, with the hammer. By this means a Damascus-curved blade may be brought nearly straight. Blades made in this way are proved, previously to grinding, by striking them upon stones, ramrods and gun-barrels. They may even be struck violently upon wheel tires, or heavy pieces of iron, without injury to the hammered edge.

CHAMPAGNE AND ITS PRODUCTION.

Lovers of the cup which cheers and also inebriates will be interested in the very full details of the manner in which champagne wine is produced in France. These statistics are derived from a correspondent of the San Francisco *Bulletin*, writing from Reims, the head quarters and great center of the champagne trade.

HOW CHAMPAGNE WINE IS MADE.

People who think that the sparkling nectar which they drink with such delight, and pay for so dearly, grows—corks, bottles, brands and all—on the sunny hill-sides, and by the vine-tressed river banks of Ay, Sillery, Verzenay and Bouzay, are very much mistaken, but no more so than those who believe that the "Widow Cliquot," "Eugene Cliquot" or Charles Heidsieck, or M. de St. Marceau, or Moet & Chandon, manufacture their wine from their own grapes, or from grapes grown in any particular locality. It is true that the Widow Cliquot and Moet & Chandon in particular, own large tracts of vine-growing lands, but not nearly sufficient for the manufacture of the immense quantity of wine which they produce. Most of the vine lands in the champagne district are owned by small proprietors, some of the pieces of ground which they cultivate not being more than two rods square. The vine is a stunted little plant growing scarcely more than three feet high, and producing a little black grape. But a very small proportion, perhaps not more than one-tenth of white grape juice, is used in the manufacture of champagne wine. The vine-growers sell either the grapes or the juice, after pressing, to the wine manufacturers, and the same grape is accessible to every manufacturer. The *vignerons* bring their grapes packed upon the backs of mules to the *pressoirs* of the manufacturers, where they are weighed and a record made of the quantity purchased from each vine grower. No receipt or acknowledgment of any kind, however, is given, and the custom has always been for the manufacturer to pay one-half the amount due to each vine-grower at the end of six months, and the remainder at the end of the year. The grape receives four pressings. The result of the first, which is so light that the skin is scarcely crushed, gives almost white juice. The second pressing is more colored, but this coloration almost entirely disappears in the fermentation. The wine of these two first pressings only is made into sparkling wine. The third pressing produces a very good red wine, which is the *vin ordinaire* or common drinking wine of the country, and the fourth, in which the skins are permitted to ferment with the juice, makes a very common stuff, which is drank only by those who cannot afford to drink any other.

After the fermentation of the juice, the mixing, which gives the different brands of champagne their peculiar characteristics, takes place. This does not depend upon any particular formula, the object of each manufacturer being to compose a good wine at as little expense as possible out of the ingredients which he has at hand, and ten or a dozen different kinds of raw wine are frequently used in the manufacture of champagne. The wine remains in cask until the month of April after the vintage, when it is bottled and corked, and put away in racks, piled up like logs of wood, in the immense subterranean cellars of the manufacturers. Here a second fermentation takes place, during which a large number of the bottles, ranging in different years from five to ten per cent, explode. This is not objected to, however, by the manufacturer, as it is considered an evidence that the wine is good and frisky. After this fermentation is finished, the wine begins to cloud, and then to deposit a sediment. The bottles are then taken and placed in an oblique position, neck down, in racks, and every day a workman takes up each bottle, gives it a shake with the object of bringing the sediment down near to the cork, and replaces it in the rack, giving it, however, each day a position more nearly perpendicular. This is continued for several months, until the sediment being all deposited, either upon the cork or in the neck of the bottle, it is ready for the process of "disgorging." In this the workman seizes the bottle, cuts the string, and the cork flying out suffers just enough of the wine to escape to carry off the sediment. The bottle is then filled, a new cork put in, and stowed away again in the rack.

The last operation for the preparation of the wine for market, and which takes place two years after the first bottling, is the closage, which gives the wine the relative sweetness and fineness of flavor required. Each bottle is uncorked again, and into it is poured a little glass of *liqueur*, which is composed of the finest wine and the purest crystallized sugar. It is then labeled and shipped away.

THE WIDOW CLIQUOT.

After dinner, we walked over to Boursault, the baronial residence of the Widow Cliquot, situated on a hill-side overlooking the Marne, with vines growing almost up to the very door. The old lady was at home and received us graciously. She is now in her 87th year, but is well preserved, wears no spectacles, and keeps all her farm and household accounts herself. She is said to be worth 30,000,000 francs, and this, with the immense reputation she has acquired and such a splendid chateau, ought to be enough to satisfy any reasonable mortal.

THE CELLARS.

Most of the wine merchants have their cellars beneath their houses, and these immense subterranean caverns are some of them two or three flights of stairs in hight, or rather in depth, the lowest part being at least 90 feet under ground. I rode over to Epernay yesterday, which is about an hour by rail from here, between hills covered and reaching to the very rails with the champagne vine, passing by the little village of Ay, nestled in among vine-covered hills extending down to the banks of the sleepy sluggish Marne. We came over to visit the cellars of Mons. Moet & Chandon, which are as extensive as any in the district. Going down a flight of stone steps, we reached a little room, where the guide furnished us with candles, and preceding us, led us through these catacombs of champagne. The vaults are cut in the solid rock, having been made a hundred and fifty years ago, and are between five and six miles in extent, winding around in labyrinthine mazes, and consisting of two sets of tunnels, one hewn under the other. In all these, bottles of champagne to the number of about 5,000,000 were piled up in racks, the butts toward us, and many of them covered with the mold which we could easily imagine would soon cover everything left long in that damp, dank atmosphere. Occasionally we came upon men working, bottling and corking, and "disgorging" and "closing" the wine. Eight men, the guide informed us, could bottle 1,200 a day. The workmen receive five francs per day for their labor, which, considering that they usually die of diseases necessarily contracted in that horrible atmosphere before they reach the age of 40, certainly cannot be considered high. I had a little talk with M. Moet, who informed me, in rather a polite way to be sure, that he thought the United States Government was "no better than it should be," and that it had "grand tort" in taking his champagne—that not a bottle of genuine "green seal" should go to America till matters were arranged, and that if the French Government did not take the thing in hand they ought to be ashamed of themselves. After thus freely delivering himself, he invited us into his house, where we discussed something pleasanter than this "vexed question," a bottle of the delicious, sparkling "cachet vert," which it is certainly to be hoped is not to be banished from the table of the *bon vivants* of the United States.

A FEW FACTS ABOUT CHAMPAGNE.

In this region of country, however, Moet & Chandon, most of whose wines have been sent to America, have only a second-class reputation as manufacturers. The highest-priced and the generally acknowledged really best wine is that of L. Roederer & Co., which goes to Russia, and to one American port only—Boston. The Widow Cliquot is next in repute, and then comes the "Piper," then "St. Marceau," and then Eugene Cliquot (who is no relative of the widow), and then the Heidsiecks. There are three houses of Heidsiecks—the "Piper Heidsieck," Heidsieck & Co., and Charles Heidsieck. The most costly and finest-flavored wines are sent to Russia. For England a much heavier one is made, and something between the two for America. The newly-established house of Theophile Roederer & Co. have invented a plan of corking, by which, by giving a pull upon the string, the wire is cut and the cork flies out without the necessity of using any cutting instrument. There are here a number of firms of champagne manufacturers who have never been heard of in America, some of whom intend taking advantage of the present state of affairs to establish a trade there. At the hotel in Reims, the best brands of champagne are sold at 7 francs the bottle, and the ordinary ones, such as "Ay-Sillery" and "Verzenay," which nobody cares to father, at 4 and 5. Some very superior red still wines are made in the champagne district, particularly the "Bouzy," a wine very much resembling Chambertin, and which sells in the "piece" at the rate of about 4 francs a bottle. Sparkling wine is considered the best about a month after its last bottling, and about two years and a half after its vintage. After 6 or 7 years it deteriorates.

PROSPERITY OF OUR MANUFACTURES.

The Providence *Journal* of Dec. 28th contains a detailed account of the building in the State of Rhode Island during the last year. The new buildings cover 13 acres, a large proportion being manufactories 4 stories in hight; the inflation of the currency has checked to a large extent the building of dwelling houses, and there is a scarcity of tenements. A few items in the statement are of general interest.

THE BURNSIDE RIFLE CO.'S WORKS.

This Company have retired from the manufacture of fire-arms in consequence of the termination of the war, during the four years of which they have turned out for the Government some 85,000 breech-loaders, 55,000 of the Burnside patent, and 30,000 of the famous Spencer seven-shooter, together with nearly 25,000,000 cartridges.

The Company are about changing their works into a locomotive manufactory, having the necessary room, power and buildings for that purpose, with the exception of a foundery and erecting shop, which are now being built of wood and brick; the former will be 85 by 20 feet, the latter 60 by 138, with an addition to their boiler shop 45 by 52 of brick, making this building 52 by 167.

This change in business involves the sale of most of their gun machinery, and the substitution of lathes, planers and other heavy machines adapted to the work contemplated, which are being constructed at various machine shops in the country. With the experience of old locomotive builders, combined with large airy shops, new tools and the latest improvements, they expect to turn out engines which will be interchangable in their parts, and will combine the requisite qualities of safety, durability, speed and economy of fuel.

The Company hope to have their first locomotive running by the first of June next, and when in full operation will turn out 150 per year—giving employment to about 1,000 hands.

BREECH-LOADERS FOR THE ARMY.

The Providence Tool Company, at their armory on Wickenden street, during the past year, have completed their work upon Springfield muskets, hav-

ing made in all more than 80,000. They are now engaged in the preparation of tools for the manufacture of the "Peabody Breech-loading Fire-arms." These arms will be made for infantry and cavalry use, and for sporting purposes. Probably no gun has ever been produced which has received so universal commendation. It was the gun selected out of sixty-five presented to a board of officers, appointed a few months since by the Secretary of War, to examine all recent inventions of small arms. It has received high approval in several countries, and is now before a number of foreign governments. This Company are also now engaged extensively in the manufacture of cotton machinery, especially ring spinning and speeders. They are about erecting a foundery, and will convert a considerable portion of their armory into a machine shop for the above purpose. At the Company's works, in North Providence, the manufacture of cast steel has been inaugurated with very satisfactory results. Nail and rivet hammers, beside many other articles, are being made by them from their own steel, and the manufacture of axes and hatchets will soon be added. The manufacture of cast steel is entirely new in our State—in fact it is a business which has not been known in our country until within a very few years. We have better ores and coal for this purpose in this country than there is found elsewhere, and yet for many years we have afforded the English manufacturers an immense market for their steel, and aided materially in enriching them.

American Velvet.

The machinery for the manufacture of velvet, in use by the American Velvet Company, was introduced into this country by them, under the superintendence of the inventor himself, Mr. Holt of Cheshire, England, who has entire charge of their establishment. It has been patented in England, France, and the United States. The superiority, in the matter of rapidity, of the manufacture by this machinery over the old method is as great as that of the modern railroads for purposes of locomotion over the old stage-coach system, or of the sewing machine of to-day over the ordinary mode of needle work. The old method is as follows:—grooved brass rods or wires were placed under the web which forms the pile, secured by threads woven in the warp. The weaver cuts the threads by means of a knife, held in the hand, the blade of which slides along the groove, dividing the pile into two rows of threads, thus giving a nap or pile of the depth of the rod inserted. The manufacture according to the patented method is accomplished by weaving two warps or foundations, with a middle warp alternately rising into the upper and lower, being secured by two shuttles moving at once. The knife moves horizontally, in the same direction as the shuttles, and the two warps and the pile between are divided, and the naps are cut into equal lengths. Two piled fabrics, the exact counterparts of each other, are thus made at one time. The shuttles and knives are all impelled by the ordinary motions of the power loom. The statement that 110 picks or threads are made in a minute (or nearly two every second) will give some idea of the rapidity of the manufacture. A man with the patented machine can make from 50 to 60 yards per week, while 8 or 10 yards would be a good week's work for the same person should he make use of the ordinary hand loom. The saving of labor by this process over the wire-weaving method is estimated at from fifty to seventy per cent, while the fabrics are equal, and in some respects superior to those of foreign make.

These looms were invented and imported for the especial purpose of manufacturing plush for gentlemen's silk hats, and in this article the Company claim that their workmanship cannot be equalled. American hat manufacturers, with but few exceptions, have abandoned the practice of sending their orders abroad for this material, and purchase their plush from the American Company. The looms are, however, adapted to the manufacture of all kinds of piled fabrics, since an article of this nature for gentlemen's caps has become very popular as a substitute for fur. Tartan or clan velvets are also made.—*Newark Sentinel.*

No less than 800 tuns of lead were obtained in one year from the dust accumulated in the long flues of a melting establishment in the north of England,

PLANS FOR COOLING AND VENTILATING BUILDINGS, BY MORIN AND REGNAULT.

The last number of *Le Genie Industriel* contains a report of plans recently presented to *l'Academie des Sciences* by two of the most eminent masters of science in France, General Morin and M. Regnault.

General Morin presented a memoir in which, after discussing at length the great injury to comfort and health that results from confined and heated air in workshops, dwellings, railway stations, and other buildings, he described the four methods of cooling that have been tried at the *Conservatoire des arts et metiers.*

By the first plan, the air, as it entered the building, was made to pass through a shower of water falling in spray. This required a large quantity of water, and it cooled the air only a little more than two degrees.

The second system consisted in passing the air through a vessel similar to a surface condenser—the air coming in contact with one side of a metallic sheet, the other side of which was exposed to a current of cold water. This system was effectual, but it required a very large surface, and it was necessary to cool the water with ice—one kilogramme of ice being consumed for every cubic meter of air cooled.

The third plan was simply to make openings in the building, so numerous and so arranged as to secure a rapid circulation of air. The discharge chimneys should be of sheet iron, rising ten feet above the roof, and should be of sufficient capacity to discharge all the air in the room at least twice an hour, with a current of 16 to 20 inches per second. The passages for the supply of air should open on the shaded side of the building, they should be as numerous as possible, and of sufficient capacity to keep up the supply with a current of 12 to 16 inches per second. The windows on the southerly side of the building should be shaded.

The reading of the memoir called up M. Regnault, who stated that in 1854 he was called upon by *M. le Ministre d'Etat* to propose a project for ventilating the buildings then in process of construction for the great international exhibition of 1855. In his project he rejected the processes founded on the cooling of the air by artificial means, and those in which ventilation is produced by machines; these means have always appeared to him inefficacious, embarrassing, and much too costly; he has always thought that the heat produced by the sun's rays gives a motive force more than sufficient to produce all the ventilation that can be desired in the summer season.

M. Regnault then described at length his plan for ventilating the great building. It was simply to make the roof—whether of zinc or of glass—double, with a space between eight inches in depth. The air was discharged from this space through numerous rectangular sheet-iron chimneys, exposing their broadest side to the action of the sun. The cool air was brought in from the north side of the building through subterranean channels of brickwork, and discharged through large hollow pillars of cast iron, which also served as supports for ornamental works of art.

Velocity of Light.

The observations of the eclipses of Jupiter's first satellite, and those of the phenomena of aberration, lead directly, although with a different degree of approximation, to the determination of the time light occupies to run over the mean distance of the sun from the earth. To deduce from this the absolute value of the velocity of light referred to our ordinary units of length, we must know how many miles are contained in the distance from the sun to the earth. The value of this distance is found by means of the parallax of the sun; we designate thus the angle under which, being at the sun's center, we would see the radius of the earth. The sun's parallax, calculated from the observations of the last transit of Venus over the disk of the sun is fixed at 8·57 seconds; hence the distance of the sun from the earth is equal to 24,109 times the radius of the earth, or to 95,384,900 miles. As this length is run over by the light in 8 minutes 18 seconds, or in 498 seconds, we conclude that the velocity of light is 191,391 miles in one second.

However, for some years, several circumstances have conspired to make us believe that the determination of 8·57 seconds given as the value of the sun's parallax is too small, and that the parallax ought to be augmented by a quantity not less than the thirtieth of its value, which would elevate it to about 8·9 seconds. From this increase in parallax results a diminution in the earth's distance from the sun, and consequently in the distance gone over in 8 minutes 18 seconds by the light; the velocity of light will therefore be reduced to a little less than 186,420 miles in a second. The next transit of Venus, which will happen in 1874, cannot fail to set at rest all doubts which may yet remain on this point.—*Delaunay.*

Safety Switches.

The numerous accidents that have lately been caused by running trains off the track at misplaced switches, has caused more than ordinary remark and sharp criticism by the general newspaper press. These strictures are every way deserved. There is no excuse for this class of accidents, none whatever, and when they take place, no matter whether the switchman is either stupid or drunk or not, the company or the manager is at fault. There is a simple guard against all these disasters, easily applied and open to every railway company in the land; and it is comparatively inexpensive too. We refer to what is commonly known to railway men as the Tyler switch. Some fourteen or fifteen years since, we wrote several notices of this invention, recommending it in the strongest terms to the attention of railway men. Some few companies adopted it; but, as its use cost something for the patentee's fee, it did not go into general use, and has not to this day, in spite of all its really practical merits as a matter of safety and economy. Had this switch been generally adopted then, its use would have saved railway companies more than fifty times the amount of the patent fee, and the cost of the switches thrown in. The patent has now expired, we understand, and the inventor we fear has been but very illy paid for his labor and thought in perfecting this truly useful design; and now railway companies can use this invention without feeling that they have got to pay a few extra dollars for the discovery. The design of the Tyler switch is to prevent the train from running off when the switch is set to the wrong track by design or accident. The single rail or gate switch is established as the best switch for the ordinary purpose of shifting cars from one track to the other, but is liable to the serious evil of leaving one track open or broken when connected with the other. This improvement removes this evil, and while it accomplishes this important office, leaves the switch in its original simplicity and perfection of a plain unbroken rail, connecting one track with the other in its legitimate use. An important feature in this safety switch, which distinguishes it from all others designed for the same purpose, and which constitutes its chief virtue, is, that the safeguard or portion intended to to protect the switch, is always in position, and requires no action of the train to place it right when it comes upon the open track, thereby avoiding all reliance upon the movements of complicated machinery which may be displaced by ice, gravel, flaws in the material of which it is made, or any of the known obstructions to such apparatus. Cases have occurred where trains have passed over this switch when set wrong by mistake, at a speed of forty miles to the hour and still kept the track. During the past week, we have seen an engine run over this switch, purposely set wrong, without experiencing the slightest trouble. It is enough to say of its practical merit that it has been generally adopted throughout New England, the exceptions being very limited, and that it meets the entire approbation of our most intelligent Superintendents and Master Mechanics. It is the safeguard that it pretends to be; and hereafter, when disasters happen by trains running off at switches, it will be the duty of juries, when estimating damages, to ask whether the companies have availed themselves of this switch. If they have not; then the company should be assessed for its neglect.—*Railway Times.*

Dr. Ure says, "All the artificial alloys of silver, with steel, of which so much has been said, are not fit for anything, and are never met with in commerce."

THE FOOT LATHE.

Number 6.

METAL SPINNING.

Spinning sheet metal into various forms is another kind of work which can be done in the foot lathe, and it is here that the amateur can show his taste and dexterity.

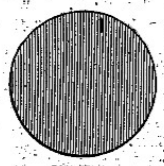


Fig. 25.

The process consists in forming a blank, like the engraving, into an ornamental base for a lamp, or an oil cup; in fact, any thing whatsoever. All that is requisite is to have a fac simile, in wood, of the shape you wish to make. This is bolted or otherwise made fast to the face plate, and the blank is then set up against it, and held as the cylinder head shown in Fig. 21, is; that is, with a rod leading from the back center of the lathe to the work.

A tool like this is then used to press the metal into all the recesses, or curves of the pattern. The speed must be high and the metal quite soft, and moistened with a little soapsuds or oil, so that it will not be scratched by the tool.

Fig. 26.

To spin metal requires some dexterity, but it is easily acquired after a little practice. The rest must be furnished with holes like this figure, and a pin, so that the tool can be brought up against it like a lever.

Fig. 27.

Still another kind of metal spinning can be done in the lathe. This relates to making circular shapes, or cylindrical, more properly—such as napkin rings, the tops of steam pipes, or similar things. To do this a mandrel is requisite. The mandrel must be of steel and turned to the desired pattern—like this, for instance:

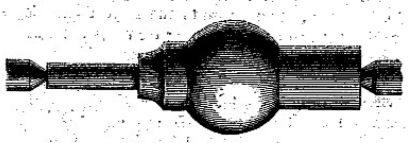


Fig. 28.

A ferrule is then made and soldered together with lopped edges, so that there will be no seam. The mandrel must be as much smaller than the size of the finished work as will allow it to come off freely, for it will be apparent that if the work was spun up *on* the mandrel it could never be taken off. The ferrule when put on them will stand eccentric to the mandrel, as in this figure—that is, when the tool bears on it. In other respects the process is just the same as spinning on the face plate. Tripoli, chalk, whiting, rotten-stone, and similar substances, are used to give the fine polish on such work.

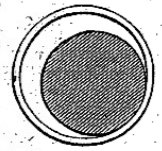


Fig. 29.

We know of no prettier or more expeditious process of making a small steam boiler for a toy engine,

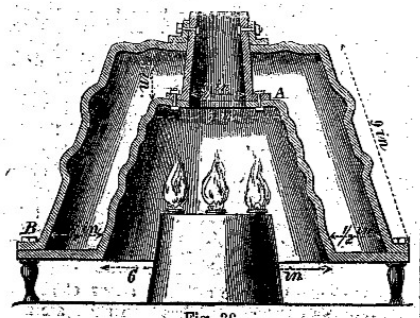


Fig. 30.

than by spinning it upon the lathe. The boiler will be very strong, have large fire surface, and be without joints, having only one at the bottom, where it is easily kept tight. Fig. 30 is the boiler.

The metal must be thin (twenty gage), the sheet brass sold in the shops will answer, as it is already annealed, and the corrugations must not be too deep on the sides, or the work will not come off the mold. The center of the fire-box, A, must be left flat so that the flue will have a bearing on it. For a small engine, 1-inch bore and 2-inch stroke, a boiler of the dimensions given here is ample. The flue must be brazed or soldered at A, and the bottom must be riveted at B, for every two inches; this is not necessary, however. There are only three pieces in this boiler—the shell, the fire-box, and the flue, and the water must not be carried more than three-fourths of an inch over the crown of the furnace.

We shall now again revert to cutting tools.

Probably many of our readers, who use hand lathes not furnished with slide rests have wished for that indispensable appendage where boring is to be done. For ordinary turning, we do not appreciate a slide rest on a hand lathe so much as many do that we know, but for boring out valves, cocks, or, in fact, any thing, a chuck and a good slide rest are invaluable.

Some persons are always "meaning" to do a thing, yet never do it. Sometimes, for the want of facilities, at others for the lack of an idea. If the latter be of any value we can furnish one or two on this subject that may be useful.

One way to bore out holes parallel, without a slide rest, is to do it with the spindle of the back head. With a tool of peculiar construction, holes varying in size can be bored beautifully in this way. We present a view of such a tool in Fig. 31. It is merely a

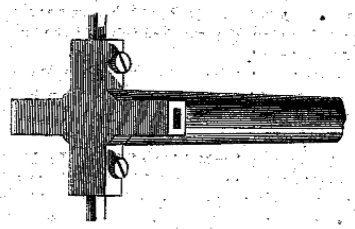


Fig. 31.

cross formed on the end of a center fitting the back spindle, the same as the lathe center does. The arms of the cross are made stout and thick so as to admit of a square hole being cut in them. The hole is made by drilling in and driving in a square drift afterward to take off the corners. The shanks of the tools are well fitted to these holes in the arms, so that a slight pressure of the screws in the side of the arm will hold them steady. When used the tool is put in the back spindle, and the cutters set to the size required, or less, if there is much to take out, and run through the work in an obvious manner. Any range of size can be had up to the diameter of the cross. It is not well to run the cutters out too far, however, as they will jump and chatter, or spring, and made bad work. The tool is so easily made that one can afford to have three or four for different jobs.

Another plan, but not so good, is to make a common center and disk, like Fig. 32.

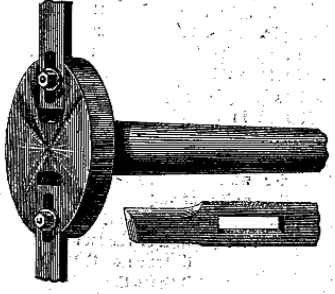


Fig. 32.

Here the cutters have a slot in them which a bolt passes through and screws into the disk; a small piece of wood put at the bottom of the tool, between it and the cutter, prevents it from slacking off so as to diminish the cut. These tools will be found useful and will do good work if properly handled. This latter tool is better for wood, but will answer for any metal by varying the cutters.

To make a slide rest in the common way is a costly and tedious job. For all purposes of boring, a good one may be made as shown in the following engraving, Fig. 33—

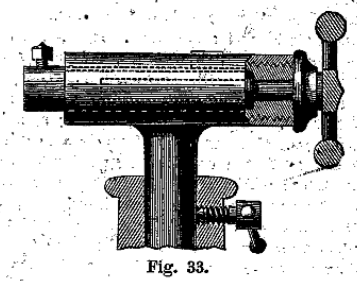


Fig. 33.

This is simply a casting fitted with a screw and spindle, as shown. The spindle has a tool let in the front end and held there by a set screw, and there is a wheel at the back end to run the spindle in and out. The casting has a leg to it which enables it to fit the common post the rest for the hand tool fits. There is also a key to prevent the spindle from turning round. By this arrangement it is easy to bore, not only parallel holes of any size, but tapering ones, which is often a great convenience. By a simple change of tool it can also face off any casting, and can easily be made to cut a thread of a given pitch by any ingenious workman. Not only this, but it can also be made without planing or other work most amateurs have no facilities for. It is within the range of ordinary lathe work, and will be found indispensable. The T-head may be of cast iron, but the spindle should be steel, with a brass nut let in the back end for the screw to work in.

[To be continued.]

TWO KINDS OF ELECTRICITY.

A very simple contrivance will suffice for examining the fundamental phenomena of electricity as developed by friction:—

Soften a little sealing-wax in the flame of a candle, and draw it out into a thread 8 or 10 inches long, and of the thickness of a stout knitting pin. Attach to one end of it a disk of paper about an inch square; suspend this rod and disk by means of a paper stirrup and a few fibers of unspun silk from a glass rod fixed horizontally to some convenient support. Now rub a stick of sealing-wax with a bit of dry flannel, and bring it near the paper disk: the disk will at first be strongly attracted, and will then be as strongly driven away. While it is in this condition of repulsion by the wax, bring toward it a warm glass tube that has been rubbed with a dry silk handkerchief; the disk will be immediately attracted, and in an instant afterward it will again be repelled, but it will now be found to be attracted by the wax. It is therefore evident, that by the friction of the glass and of the wax, two similar but opposite powers are developed. A body which has been electrified or charged with electricity from the wax, is repelled by the wax; but it is attracted by the excited glass, and *vice versa*. In order to distinguish these two opposite powers from each other, that power which is obtained from the glass, has been termed vitreous or positive electricity; that from the wax, resinous or negative electricity.

Let us suppose that the paper disk has been charged by means of the glass tube, so that it is repelled on attempting to bring the glass near it; this state will be retained by the disk for many minutes. This contrivance forms, in fact, an electroscope, for it furnishes a means of ascertaining whether a body be electrified or not, and even of indicating the kind of electricity. Suppose that a body suspected to be electrified is brought near the disk, which is in a state repulsive of the glass tube; if repulsion occur between the disk and the body which is being tested for electricity, it is at once obvious that the substance is electrified; and, moreover, that it is vitreously electrified, since it produces an effect similar to that which would be exhibited by an excited glass tube.—*Miller.*

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening Jan. 4, 1866, the President, Prof. S. D. Tillman in the chair.

LIVE FROZEN FISHES.

The President read a brief abstract, in the London *Chemical News*, of the results of a long series of investigations by M. Pouchet on the freezing of animals. Among these conclusions are the following:—That no animal completely frozen is ever restored to life; that the first effect of freezing is to contract the capillary blood vessels, and expel from them the blood corpuscles; that as the freezing extends it destroys the blood corpuscles within the sphere of its action; that the remains of these destroyed globules mingling with the healthy blood exert a poisonous influence upon it, and if this influence is of sufficient extent it proves fatal.

Dr. Feuchtwanger remarked that the statement must apply to warm blooded animals only, as it is well known that the life of a fish is not destroyed by freezing, provided the thawing is conducted very slowly. The speaker said, however, in reply to a question, that he had never observed this personally.

Dr. Rowell said that he had seen eels frozen solid in mud, and when they were slowly thawed in cold water they swam about as lively as ever.

Capt. Maynard said that he once took a salmon from Lake Quinsigamond, frozen solid in the ice, and put it into a spring by his grandfather's barn, and the next summer he saw it swimming about in the spring as full of life as any other fish.

Dr. Stevens remarked that the destruction of the blood corpuscles by freezing has long been known.

NUMEROUS BOILER EXPLOSIONS.

The evening was principally devoted to the discussion of boiler explosions, and the old notions were repeated at great length. The only new idea or fact advanced was a statement of boiler explosions which have occurred in the country since the 12th of October, read by Mr. Norman Wiard; the total number was 20, the deaths caused 92, and the wounded 92.

FORCE, POWER, AND WORK.

Mr. Wiard gave an account of the bursting of a great cannon at Pittsburg. It was cast on the Rodman plan, that is to say, it was cooled by a stream of water through the core; and it split longitudinally throughout its whole length just as it left the mold. The crack opened half an inch at the exterior surface of the gun, but the sides of the crack came together at the surface of the bore. Mr. Wiard said the cause of the cracking was manifestly the unequal shrinking of the metal; that about the core hardened first, and when the exterior hardened it was in a state of tension around the central portion. He had calculated the force requisite to overcome the tensile strength of the metal in producing this rupture, and it amounted to 92,000,000 pounds.

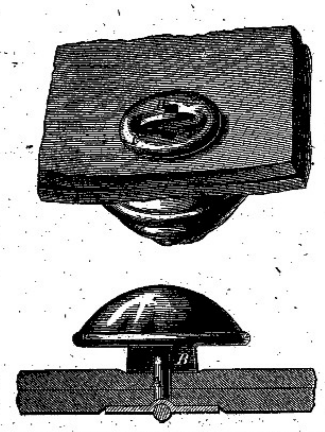
Mr. Blanchard said the force in this case amounted to nothing—it was not so much as he could produce by a few motions of his arm. There was no force unless it acted through some distance. There was a general misapprehension about this matter.

[If we understand Mr. Blanchard, he confounds force with "work" and with "power." Mr. Wiard uses the word in the signification attached to it by philosophers in employing it to express the energy requisite to overcome the tensile strength of the iron. The measure of force is independent of the distance through which it is exerted, or of the time in which it acts. If force acts through any distance it performs "work," and the quantity of work is proportioned to the amount of force and to the distance through which it is exerted. "Power" is constant energy, which is capable of performing work continously, and it is measured by the quantity of work which it can perform in a given time.—Eds. Sci. Am.

Effect of Free Schools.—Dr. Bellows, President of the Sanitary Commission, has published a note saying that the statistics show that eighty per cent of the soldiers of the Union armies were Americans; and that, as nearly as can be ascertained, of all those asking charity or assistance in any way since their discharge, ninety per cent are foreigners.

BARNUM'S BUTTON.

This invention represents a new method of attaching buttons to clothing without the use of needle or thread. The method of attachment is wholly mechanical, and the button is practically irremovable by accident; it can, however, be taken off in a moment when desired. The hold of the button is perfectly secure, the cloth is strengthened by the fastening and the lap of the button-hole about the button is also better by reason of the projection or clearance between the button and the cloth. The invention is very clearly shown in the engraving. The button has a long shank, A, which is formed into a T at the end; between the button and the cloth is a piece of rubber, B, through which the shank passes. The washer, C, has a slot, D, and a slight depression in it; the T is pushed through this slot and turned so as to fall in the depression; the spring of the rubber then draws the button up firmly to the washer, and holds all parts beyond the chance of slipping. If preferred, a metallic spring can be used instead of the rubber.

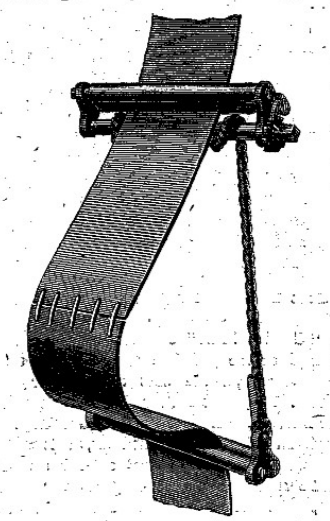


This is a very neat and substantial fastening, and should become popular. The invention is for sale or to lease on favorable terms to any parties who will give it a fair trial.

It was patented through the Scientific American Patent Agency by C. T. Barnum, of Waterbury, Conn., on Sept. 12, 1865; for further information address him at that place.

ROGERS'S BELT STRETCHER.

Every mechanic and manufacturer knows that much time is often lost by the defection of the large driving belts in workshops. They often give out in working hours, and require to be laced thoroughly in order to get along at all. At such times belt stretchers are in great request, but through the inefficiency or bad construction of the ones commonly used, the operation is rendered very tedious, and the belt is often made to run "out" by stretching one side more than the other.



The machine here shown is the best one of its kind that we have ever seen. It performs its work remarkably well and can be handled by any shop laborer. It is not necessary to cut the belt before putting this stretcher on, but it may be applied, the belt drawn up, and then cut to the proper length without any guess-work. It will take any belt, thick or thin, and will draw up the same to the right degree of tension in a few minutes—the inventor says "two."

The invention consists of a set of eccentric rollers, applied as shown, and a ratchet wheel on the end of a winding shaft to take the strain and prevent the belt from slacking or slipping. The rolls being eccentric to their axes bite without bruising or injuring the belt, and the increased tension of it causes them to bite still harder. No letters of reference are applied, as the principle of the thing is seen at a glance.

A patent on this invention was allowed, through the Scientific American Patent Agency, on Dec. 16, 1865, to Seymour Rogers, of Pittsburgh, Pa. For further information concerning the patent which is offered for sale, address him at that place.

MISCELLANEOUS SUMMARY.

A Pump Propeller.—The London *Mechanics' Magazine* says that a vessel is now building for the English Admiralty, by the Thames Iron Works and Shipbuilding Company which is remarkable as having been designed on a plan expected to supersede all other steam vessels, screw or paddle, by proving the practicability of propelling vessels by sucking in a column or "rope" of water, by a turbine wheel arrangement, through a ship's bottom and squirting it again out of the ship through her sides. It is feared that, whatever results may be obtained, they will be rendered unimportant by the excessive cost of their production.

Mr. Sartorius von Wattershausen, a distinguished geologist, who has devoted several years to studying the phenomena of Mount Ætna, has determined, by ascertaining the specific gravity of the boiling lava thrown from the crater of the volcano, that the depth from which the substance is raised is something more than seventy-seven miles, and that the force by which its expulsion is affected, is equivalent to the pressure of 36,000 atmospheres.

Where was the First Rail Rolled?—Mr. W. S. Langridge, of Aldermasley Iron Works, Ambergate, says, in the *Mining Journal*:—The first rail ever made was at the Bedlington Iron Works, Northumberland, and from these works a staff of men were sent to Penydarron to teach the Welshmen to make rails.

Geo. W. Day, of Chelsea, Mass., the inventor of a machine for making shoes which drives the shoe thread like pegs, a good imitation of pegged work, has sold his interest for $200,000, and is to receive a per centage on every pair of boots made by this process.

American Lithographic Stone.—Mr. S. D. Morgan, of Nashville, Tenn., states that there is an abundance of lithographic stone in Tennessee, in all respects equal, according to tests, to any from Bavaria or elsewhere.

The ancient Greeks used a mixture of salt, niter, and alum when melting their gold, by which substance the silver was also purified. It is not improbable that lead was also added, to promote the flux of the metals.

The French Exhibitions or National Expositions date from the year 1797, when the first was held in the palace of St. Cloud, with the object of reviving the industrial resources of France, which had suffered much during the revolution.

The Siberian plumbago differs considerably from that obtained in Cumberland, inasmuch as it is almost impossible to erase the marks of the former by India-rubber.

Photographic Mosaics.—This is a most interesting little work for photographers, comprising accounts of all the leading discoveries and improvements in the art during the past year. The editors are M. Carey Lea and Edward L. Wilson, whose names upon the book are a sufficient guarantee of its practical excellence and value.

Correspondence

Explosion of Boilers in a Blast Furnace.

MESSRS. EDITORS:—Last evening at half-past seven o'clock, an explosion occurred at the Cordelia Furnace, about three miles from Columbia, causing the instant death of one man and the serious injury of three or four others. The blast engine was furnished with four boilers, three of which exploded and were scattered in fragments over the surrounding fields. A more impressive example of the terrible force of steam is seldom exhibited. One boiler weighing about five thousand pounds was lifted from its bed and thrown a distance of one hundred yards, cutting off in its course two trees, each eight inches through. Fragments of the other boilers, weighing from 200 to 500 pounds, were thrown 300 yards into the fields, and bricks, timber, and other debris scattered thickly in every direction. A stable standing near the furnace was so shattered by the flying bricks that it presented the appearance of having undergone a lively shelling. The engine house, shops, and hot oven were completely demolished, and considerable damage done to other parts of the furnace.

With characteristic energy the proprietor ordered repairs to be commenced on the morning after the disaster, and it is expected that the furnace will soon be again in blast. W. SCOTT.

Columbia, Pa., Dec. 29, 1865.

Pharaoh's Serpents.

MESSRS. EDITORS:—I notice in the last number of your valuable journal an article under this head from one of the English papers, and send you, if acceptable, the formula which I use for their manufacture, as being both cheaper and better.

I take a strong solution of a sub salt of mercury, say the sub-nitrate, and precipitate it by a solution of sulpho-cyanide of potassa (potassium?), not ammonia. The precipitate thus obtained is washed well while on the filter, and when nearly dry made into little pill-shaped balls, or dried spontaneously in the air, and when quite dry filled into little cones of tinfoil. The sulpho-cyanide of potassa is very easily prepared by heating in an iron spoon (covered) to redness, a mixture of 46 parts finely divided prussiate of potash, 32 parts sulphur, and 17 parts carbonate of potash. The black mass thus obtained is treated with hot water, agitated and filtered. The colorless filtrate is the solution of sulpho-cyanide of potassa, used for the above. V. G. B.

Brooklyn, Jan. 6, 1866.

Speed of Railway Trains.

MESSRS. EDITORS:—It is sometimes very desirable to know the rate one is travelling when on a railway train, and this is correctly and readily ascertained by observing the number of telegraph posts passed in a given time, and deducing the miles per hour from that data. It is more simply done by counting the number of posts passed in one minute and fifty seconds by a watch, assuming that the posts are placed at a distance of ten rods from each other, which I believe is the case, and that will be equal to the miles per hour the train is moving. The train passes 32 times as many posts as it moves miles per hour; therefore $\frac{1}{32}$ of the whole number of posts will be equal to the required velocity, and they will be passed in the $\frac{1}{32}$ of an hour, which is equal to 1 minute $52\frac{1}{2}$ seconds. S. W. B.

Chicago, Ill., Jan. 2, 1866.

[This rule will be near enough for all practical purposes, if the posts are set at all uniform in different parts of the country.—EDS.

Blueing Steel.

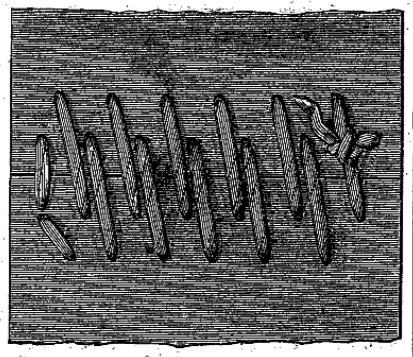
MESSRS. EDITORS:—A friend of mine informed me that he saw in your paper, some time past, an article on blueing as done in Europe on small work, such as watch springs, etc. Could you also inform me as to the method of cleaning work before blueing? It is easy to clean plain, smooth surface work, but that with irregular surface it is somewhat more difficult. As my work sometimes comes in contact with acid, what will destroy the acid, as I find the acid destroys the blue. What oil would you recommend to put on such work? What degree of heat is necessary to produce the first blue?

E. W., of the firm of Spencer & Co.

New Haven, Conn., Dec. 28, 1865.

To Lace a Belt.

MESSRS. EDITORS:—Allow me to suggest an amendment on the belt question. One of your correspondents says, in lacing a belt the lace should always be crossed on the outside of the belt. I have had experience for upward of twenty years in such matters and don't cross at all; I make two rows of holes as shown in the engraving. By this plan I



find a lace will last twice as long as it will when crossed. WILLIAM ANNAN.

Morrison, Ill., Dec. 17, 1865.

[This method is expeditious, but we think the tie should come in the middle, not at the end.—EDS.

Something About Stamps.

The contract for furnishing stamps was given in 1861 to the National Bank-note Company, which now annually supplies 220,000,000 more stamps than in the first year of the contract. During 1865, the company furnished government upward of 400,000,000 stamps, and the demand frequently exceeded a million and a half per diem. The following will be read with interest:

The largest number ever delivered in one day was 5,923,896. The consumption of stamps of different values may be understood from a statement of the proportions manufactured in the month of March last, when there were delivered to the government of

4-cent stamps...	175,200	12-cent stamps..	322,900
2-cent stamps...	14,477,250	24-cent stamps..	480,300
3-cent stamps...	85,933,850	30-cent stamps..	140,650
5-cent stamps...	257,340	90-cent stamps..	19,490
10-cent stamps...	10,100,640		
Total.....			102,026,620

The value represented by these stamps is $3,207,199 50. The same writer says that the entire number supplied by the National Bank-note Company up to the present time, is one billion three hundred million. To meet a demand so vast, the presses are sometimes run night and day, and, to avoid error in accounts, a daily balance of the business is struck. In furnishing this immense number—representative of a value of $40,000,000—not a single loss involving censure to the company has occurred, and the stamps are printed, perforated, gummed, and packed for delivery from the company's office to all the United States post offices for twelve cents a thousand.

The Best Pear and Apple for General Cultivation.

The "Greeley Prize" Committee of the Farmers' Club has given the premium to the Baldwin apple and Bartlett pear, as the best adapted for general cultivation. They were not unanimous. The vote was four for Baldwin, and three for R. I. Greening. The Hubbardston Nonsuch was ruled out, as it was said the fruit would not keep in good condition until the first of February. The vote on pears was four for Bartlett, and three for Sheldon. The committee then recommended six varieties of apples and six of pears for general cultivation, to consist of two summer, two fall, and two winter varieties. Summer apples—Primate, Red Astrican. Fall—Porter, Gravenstine. Winter—Hubbardston Nonsuch, Northern Spy. Summer Pears—Manning's Elizabeth, Rostiezer. Fall—Sheldon, Seckle. Winter—Lawrence, Dana's Hovey.

Effects of Heating, Rolling, Hammering, and Annealing Metals.

Elaborate experiments and careful observations have developed many interesting and important facts with regard to the variations of density, etc., which different metals undergo in different degrees in the operations of heating, drawing, rolling, hammering and annealing.

At a temperature rather above a cherry-red, iron wire will remain three months, surrounded with charcoal, without cementation taking place, while a white heat will, in five minutes, render brittle a square bar of malleable iron, eight-tenths of an inch in diameter.

Wires of copper, and of alloys of copper and zinc, are increased in diameter, and diminished in density, by annealing. The operation of rolling condenses metals more than that of wire drawing. The density of iron and copper will be greater if the metals are heated before being passed through the rollers. The reverse in the case with alloys of copper and zinc. The density of metals is greatest when drawn into very fine wires. Hence, two small wires are stronger than one large one of the same transverse area with the united areas of the small ones. This result grows out of the fact that the particles of the smaller wires are compacted throughout their entire cross section, while those of the latter are thus compacted for a certain depth only.

Wires may be increased in length in two ways—first, by diminution in the case of its cross section; and, second, but only in a slight degree, by increasing the distances between the component particles. When wire is lengthened by the latter process, it returns to its former length by annealing.

Again, wires of certain different metals, after passing through the same hole in the wire-drawing plate, have different diameters, but all such subsequently acquire equal diameters during the process of annealing. The diameter of a wire is said to increase very slowly by time after passing through a wire-drawn plate. Wires which have been bent, and subsequently straightened, have a tendency to re-acquire the same curvature by time.

Wires exposed to a high heat lose part of their tenacity. They require to be annealed in wire drawing, not to render them more tenacious, but to allow the particles to resume the positions from which they may again be displaced.

The loss of tenacity is common to copper, iron, platinum, and the alloys of copper and zinc.

Hydrogen has an action on copper and silver, at high temperatures, which premanently separates their particles. On alloys of copper and zinc, and even silver and copper, it has no such action.

Brass wire approaches to iron in strength, while copper wire is much inferior to it; hence brass is much used instead of iron where the latter would oxydize too rapidly.

Iron wire is made of different qualities, to stand a strain from 75,000 up to 130,000 pounds to the square inch. The tenacity of brass wire varies from 78,000 to 87,000 pounds to the square inch, while copper wire will part at from 38,000 to 44,000 pounds.

These facts, with many others of a like character, have been carefully arrived at by many and most elaborate experiments, and a knowledge of them is valuable to every mechanic.—*Chemical Gazette.*

PREVENTION OF STEAM-BOILER EXPLOSIONS.—In the November report of the Manchester Association for the Prevention of Steam-Boiler Explosions, Mr. L. E. Fletcher, the chief engineer, states that he considers the danger of pumping cold water into partially red-hot boilers has been much overrated. A boiler was allowed to run nearly, if not quite empty, and the feed was turned on, yet no explosion occurred. He refers to the injudicious arrangement of feed-water heaters as a frequent cause of external corrosion; and repeats the recommendation that every man-hole should be stiffened with a strong mouth-piece faced on the joint surface. The explosion which led to the latter remarks, though unattended with fatal results, was interesting, as showing the danger of neglecting minor mountings.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office Jan. 2d:—

Sensitizing Box.—This invention relates to an apparatus by which the operation of sensitizing a plate of glass or other material can be effected entirely by mechanical means, and without holding the plate in the hands or touching it from the time it is introduced into the apparatus until it is removed from the plate holder after the picture has been taken. The plate, on being introduced into the apparatus, is placed on a pair of hooked arms or dippers, which extend from a rock shaft to which an oscillating motion is imparted by a suitable hand lever, said motion being regulated by a series of gear wheels and cam grooves, in such a manner that, when the dippers with the plate approach the cistern containing the nitrate of silver or other sensitizing solution, the cover of said cistern turns back automatically, and, as soon as the dippers with the plate have reached the proper position over the cistern, their motion ceases, and the cistern rises, and thereby the plate is dipped into the solution, and can be kept therein the desired length of time, and by lowering the cistern the plate can be left to drain. After the operation of sensitizing has thus been accomplished, the handle is turned back and the plate is carried forward and delivered into the shield. The shield is provided with spring catches, which are set at the beginning of the operation, and when the plate has entered the shield, by the handle coming in contact with an adjustable stop, said spring catches are sprung and caused to hold the plate securely in place. By closing the shield and removing it from the sensitizing box, the plate can be introduced into the camera and exposed to the light without ever touching it with the hands or fingers. Wm. Hudson, Jr., and Augustus L. Hudson, of Hingham, Mass., are the inventors.

Machine for Oiling Wool.—This invention relates to an apparatus which is composed of a brush secured to a revolving shaft which has its bearings in the ends of a cylindrical case. This case is cut open at its front side, and is supplied with oil through one or more holes in its back, the oil being admitted from a suitable tank or reservoir; the brush, on being revolved in the case, takes up the oil, and by coming in contact with a lip formed by the edge of the opening in said case, throws the oil in the form of spray over the wool as it leaves the picker or any other equivalent mechanism. The case is secured to a bed plate by slotted bearers, so that it can be adjusted to apply to the wool a larger or smaller quantity of oil, and the pipe which conducts the oil from the reservoir to said case, is arranged with a hollow globe-shaped valve, so that it is free to accommodate itself to the various positions of the case. Thomas A. Campbell, of New York City, is the inventor, and further information may be obtained of C. L. Goddard & Co., No. 3 Bowling Green, New York City.

Printers' Galley.—This invention consists in the employment, in a printers' galley, of a movable sliding lock, in such a manner that the use of quoins for locking up the galley can be dispensed with, and the operation of locking and unlocking is considerably facilitated; and, furthermore, the foreman is enabled to make up his forms for the press much more readily and in less time than he can with the old mode of locking up the galleys. Joseph Snyder, of Burlington, Iowa, is the inventor.

Rotary Rock-boring Machine.—This invention consists in a drill composed of a number of scolloped cutting wheels which are arranged in a common head on axles passing through said wheels partially at right angles and partially in oblique directions, in such a manner that, by giving to the head a rapid rotary motion, the wheels cut into the ground or rock, and a clean hole is produced. The dirt or dust produced by the operation of the cutting wheels at the bottom of the hole is raised by the action of a spiral flange secured to the outside of the drill rod which is guided by a series of friction rollers arranged in suitable heads secured to the drill rod. The drill rod is hollow, and it connects with a hose through which a current of steam or water can be introduced in such a manner that the discharge of the dirt and dust from the bottom of the hole is facilitated. Said drill rod is suspended from a crosshead, which moves up and down in suitable guides, and to which a rising and falling motion can be imparted by means of two screw spindles which revolve between suitable stationary bearings, and to which motion is imparted by bevel gears or any other desirable mechanism. By imparting to these spindles a slow rotary motion, the requisite feed of the drill is effected. Peter Sweeney, of No. 385 East 9th street, New York, is the inventor.

Table-stand for Articles of Food.—This invention relates to an extremely novel and useful stand for the reception of pies, meats, and other articles of diet, in which they can be readily and conveniently carried about from place to place, as may be desired; the said stand being made of such a construction and form as to permit of its being used with propriety upon a dining table; and also, in addition to such stand, in order to protect the articles placed on it from bugs, flies, and other insects, it is entirely surrounded or incased with and by a suitably-shaped wire-gauze frame so constructed and arranged as to enable the articles to be readily removed from or placed upon the stand as may be desired, this wire-gauze covering being susceptible of detachment at pleasure. Benjamin T. Porter, and Humphrey M. Glines, of Manchester, N. H., are the inventors.

Manufacture of Floor-cloth or Paper.—The object of this invention is to protect floor-cloth or floor-paper, after the same has been printed, by a solution of rubber put on over the colors, in such a manner that it is rendered practicable to print floor paper from rollers, the same as wall paper, the colors being protected by the rubber solution, and a cheap and durable floor-paper is produced to meet the wants of the million. Geo. F. Hopper, No. 130 Prince street, is the inventor.

Apparatus for Tanning Hides.—This invention consists in the use of a reservoir for containing the tanning solution or liquor employed, having one or more false vats or chambers made of any suitable material impervious to the liquor, and provided with one or more valves at their top and bottom, and arranged in such a manner and operated by any suitable mechanical means as to produce an oscillating motion thereof in a vertical plane, so that the hides to be tanned, being properly suspended within the said false vats, a current of the tanning liquid in the reservoir will be constantly maintained in an upward direction through the water—entering the lower valves and discharging at the upper ones—they being alternately opened and closed by the oscillating movement of the vats, whereby the hides are continually subjected to a fresh volume and supply, or quantity of the tanning liquor, swinging at the same time to and fro, and the tanning liquor also prevented from settling at the bottom, of the reservoir, because of its greater specific gravity than water; results of great importance in the tanning of hides. Thomas Sharp, of Nashville, Tenn., is the inventor.

PATENT-OFFICE DECISIONS.

Application of E. W. Blake for a reissue of patent for a Crushing Machine.

S. H. Hodges for the Board.—The machine in question is intended primarily for crushing stone. The mechanism by which this is effected directly consists of two tables, called the jaws, with surfaces nearly plane, but corrugated vertically, and facing each other. They stand upright, but nearer together at the bottom than the top. One of them is stationary, but the other is pressed toward the other in a direction nearly horizontal, and with a reciprocating movement, by means of a crank shaft with intervening mechanism, which it is not important to describe. When a fragment of stone is dropped in between the jaws, and has fallen down till caught between them, their next movement necessarily crushes it, and, when they open again, the fragments fall still lower. This operation is repeated until it is sufficiently broken up to pass through the jaws at the bottom.

The first combination of these devices that is claimed as the applicant's invention embraces the upright convergent jaws, the rotating shaft imparting a reciprocating movement to one of them by any suitable mechanism, and employed in a stone-breaking machine. The devices are all old in themselves, and the references show this to some extent. But they show no such machine, or combination, as a whole. They show nothing answering to the upright position of the jaws, nor to their converging at the bottom, and these two features are essential to the successful operation of the machine. The principal objection made to allowing this claim was that it was considered too broad, and a patent was offered if it were only amended by embracing in the combination the precise mechanism provided for communicating motion from the crank to the jaws. At first sight, indeed, it does bear a strong resemblance to those cases in which the patentee, having described how to produce a certain result by devices which he describes, undertakes to monopolize all possible means of producing the same result. But further reflection will show that it is not one of those cases. The applicant does not claim a result, for instance, the crushing of stones, however it is effected; but he claims jaws of a peculiar form, in a peculiar position, and for an especial purpose, when actuated by a rotating shaft. Now, they may be actuated by a rotating shaft by means of various devices of the most common kind. A cam on the shaft would be sufficient. If the applicant is restricted to any one of these devices his patent would be worthless, it would be so easily evaded. Presuming that the combination claimed is new, since no anticipation of it has been found, the inventor is entitled to appropriate it. And his title to it should not be jeopardized or rendered worthless by insisting upon the amendment required by the primary Examiner.

The combination of the movable jaw with the shaft and a fly wheel upon it, in such a machine, is the second invention claimed; and the combination of the jaws with such a shaft, imparting a definitely limited vibration to the movable jaw, is the third. We conceive that these include substantially what is embraced in the first; and since that is regarded as patentable, these must be also.

The fourth is the combination of the two jaws with the frame that supports them, in such a manner that they are separable from the frame. This is one of those common expedients which mere skill would suggest, when necessary, and the public cannot be precluded from the free use of it.

The decision of the primary Examiner rejecting the first three claims is reversed; his decision rejecting the fourth is affirmed.

EFFECT OF SANITARY REGULATIONS.

In November last a meeting of our most influential citizens and physicians was held at the house of Dr. Willard Parker, to consider the best means for averting the cholera and promoting the sanitary welfare of the city. A committee of the most respectable merchants and physicians of New York and Brooklyn was appointed to procure the proper legislation. This committee has prepared a health bill, and issued an address to the citizens, and has had both printed in a neat pamphlet of 68 pages. The efficiency of proper health regulations is strikingly shown in the difference in the mortality rate of our principal cities, as presented in the following table which was prepared by Dr. Snow, Health Officer of Providence R. I.:—

	Estimated population.	Deaths, 1863.	Of population, 1 in
New York	900,000	25,196	35·7
Philadelphia	620,000	14,220	43·6
Boston	194,000	4,698	41·2
Newark, N. Y.	85,000	1,952	43·5
Providence	55,000	1,214	45·3
Hartford	32,000	583	54·8

These appalling facts are further sustained by a report made by twenty leading physicians of the city of New York during the past year. They use the following language:—

"Previous to establishing a good sanitary government, the annual rate of mortality was—

In London	1 in 20
In Liverpool	1 in 28
In Philadelphia	1 in 39
In New York, at present	1 in 35x
In New York, average of last ten years	1 in 32½

"The rate of mortality in the same cities, with the present system of sanitary government, has been—

In London	1 in 45
In Liverpool	1 in 41
In Philadelphia	1 in 44 to 1 in 57

"While in the city of New York the death rate has increased from 1 in 46½ (in the year 1810) to 1 in 35+ at the present time. By means of suitable sanitary regulations, and a faithful and competent administration of such laws, the rate of mortality in this city ought to be very greatly reduced. The experience of other great cities, and the teachings of sanitary science, warrant the opinion that the present rate of mortality may be reduced fully thirty per cent. Such a reduction would save from 7,000 to 10,000 lives in this city during the present year.

"It is a medical and statistical fact, that for every death in a large community there are twenty-eight cases of sickness. This would give, in the population of our city, upwards of two hundred thousand cases of preventable and needless sickness every year?"

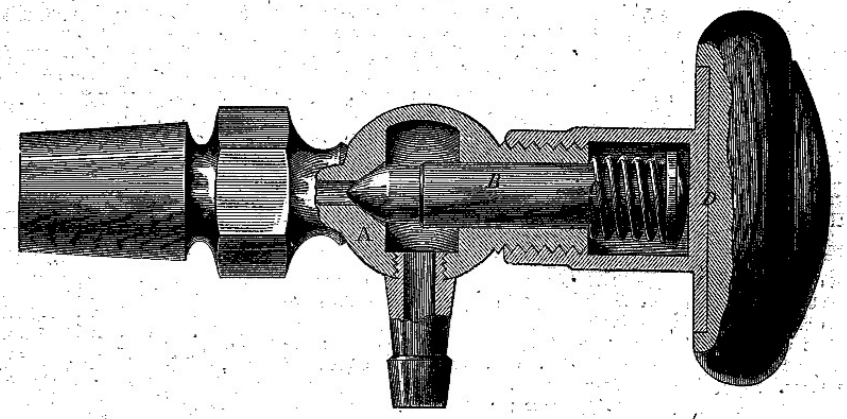
THE green color of gold leaf when seen by transmitted light may be destroyed by subjecting the metal, extended on glass or mica, to heat, a temperature as low as that of boiling oil being sufficient, if continued for several hours. When pressure is applied to such discolored gold by a convex piece of crystal of short radius, the green color of the transmitted ray reappears.

Improved Gage Cock.

It is a great annoyance and loss to have gage cocks continually leaking steam and water, or sputtering and fizzing so that one can hardly hear himself speak in their vicinity. Many gage cocks are so poorly made that, even if tight when first put in, they soon wear leaky and cause the annoyances before mentioned.

The gage cock here shown is designed to obviate these troubles, and be not only efficient, but much more durable.

In the engraving, A represents the chamber or shell of the cock, and B a valve therein. This valve is a plug, as may be seen, and has a very long bearing in the body itself, so that it is sure to work true to its seat. The valve is also larger at the head and has a spiral spring, C, fitted around the neck which bears against it and the body of the cock. The tendency of this is to force the valve off its seat and not depend on the steam or water pressure to effect the object. The head of this valve is rounded over on the exterior, and bears on a cap, D, so that by slacking off the same, the valve will be free to rise and open the passage leading from the boiler to the nozzle, and thus indicate the hight of water. By making the head of the valve rounded, a very small bearing is given on the cap; this causes the valve to remain stationary when in contact with its seat, while the cap alone rotates, thus preventing any uneven grinding of the valve on its seat and preserving it from injury. It will be seen that this gage cock gives a valve entirely independent and free of the handle, and admits of its being reground to its seat in a few minutes without the use of tools; and it is in other respects easily cleaned or got at for inspection when necessary.



BROUGHTON'S GAGE COCK.

It is durably constructed, and a patent is now pending through the Scientific American Patent Agency by John Broughton. Manufactured and for sale by Broughton & Moore, No. 41 Center street, New York.

ADMINISTRATION OF THE PATENT OFFICE.

COMMISSIONER OF PATENTS.—Thomas C. Theaker, of Ohio—Salary, $4,500.

EXAMINERS IN CHIEF.—S. H. Hodges, Vermont; E. Foote, New York; S. C. Fessenden, Maine—Salaries, $3,000 each.

EXAMINERS.—T. R. Peale, Pennsylvania; B. F. James, Illinois; Wm. Bebb, Tennessee; J. M. Blanchard, Indiana; L. J. Farwell, Wisconsin; A. M. Smith, New York; J. J. Halsted, New Jersey; T. C. Connelly, District of Columbia; Wm. B. Taylor, District of Columbia; C. G. Page, District of Columbia; J. W. Jayne, Pennsylvania; B. S. Hedrick, North Carolina; W. C. Doane, New York; J. Brainerd, Ohio; N. Crawford, Illinois; J. T. Fales, Iowa—Salaries, $2,500 each.

CHIEF CLERK.—T. Harland, Connecticut—Salary, $2,500.

DISBURSING CLERK.—H. McCormick, District of Columbia—$1,800.

LIBRARIAN.—G. C. Shaeffer, District of Columbia—Salary, $1,800.

AN ENGLISH TANK ENGINE.

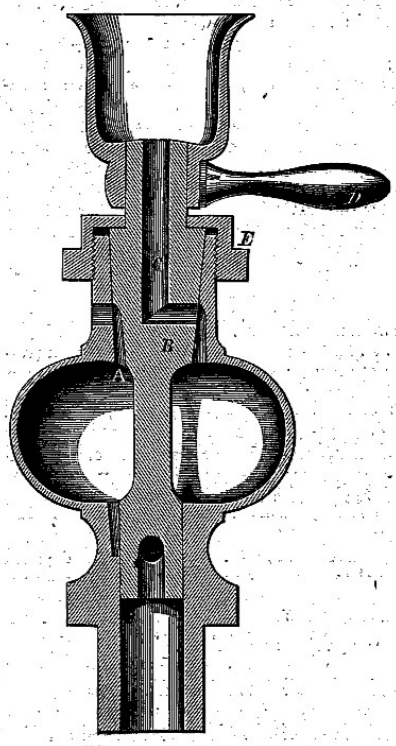
A new locomotive of a peculiar pattern has recently been constructed in England. It is a tank engine, without a tender, and is designed to haul heavy trains up grades. According to the *Engineer*, it is a cumbrous, ugly-looking machine, as our readers will surmise from the following details.

The firebox occupies the center of the engine, and there are, so to speak, two boilers, or rather, one boiler formed like two, set with the fireboxes touching each other. There are two funnels, one at each end of the machine, and two bogey trucks, with wheels 4 feet 6 inches diameter. The cylinders are four in number, 15 inches diameter, by 22 inch stroke, and the weight of the whole machine is 42 tuns. The firebox is 6 feet 6 inches long, by 3 feet 3 inches wide; and the boiler is 48 inches diameter, and has 198 brass tubes, 2 inches diameter and 9 feet long. The aggregate fire surface is 2,000 feet.

This engine was tried under adverse circumstances, being taken from the shop just as the workmen put it together, without any adjustment, and took a load of 300 tuns up an incline of 1 foot in 77 feet, the pressure being 100 pounds; and again, with the same load, it raised an incline of 1 in 85, but stuck nearly at the summit from the steam falling. When it rose a few pounds, the engine readily ascended to the top. It also easily ran round curves of 190 feet radii, and is accounted to be in general an improvement in engines of its class.

HARE'S OIL CUP.

The very many recent improvements on vessels or instruments for supplying oil to steam cylinders have



rendered them nearly perfect. In place of the old-fashioned globe cock, with its two faucets and troublesome arrangements, there are cups which, by pouring in oil and turning a handle, admit the lubricant to the engine. The cup here shown is simple in detail and very efficient. Many of the instruments alluded to are defective in the following respects: When the oil is admitted to the cylinder a quantity of steam rises and fills its place, so that when the communication is closed, this steam is shut up in the globe and blows the oil out, or burns the hand. Moreover, the globe being air-tight prevents the cup from filling properly. These difficulties are avoided in the present invention by making a small channel, A, in the upper end of the plug, B, so that while the oil is poured in, as shown by the holes, C, the air or steam issues through the other aperture. On turning the handle, D, again, the upper holes are closed, and the lower one, E, opened, which allows the oil to enter the cylinder. This cup is provided with a stuffing box on top, so that the plug is always kept in its seat.

This invention was patented some time ago through the Scientific American Patent Agency, by James Hare, whom address for further information, at No. 155 Gold street, Brooklyn, N. Y.

A Large Yield of Whisky.

Mr. H. G. Dayton, of Maysville, Ky., recently produced from 30 bushels of corn and rye—two-thirds of the former and one-third of the latter—97 gallons of proof whisky, in his improved still, for which a patent was obtained through this office not long ago. This, we believe, is the largest yield from "double distilled copper whisky" ever produced from the same quantity of grain. It is conceded by all distillers and large dealers in whisky, that the greater the product from a given quantity of grain, the better is the product.

A Steam Car Upon Ice.

The Master Mechanic of the Peninsula Railroad of Wisconsin has in process of construction an ice car, which is expected to afford unusual facility for travel upon the frozen rivers in that region. An exchange gives the following description of the vehicle:

"It will be built like a common passenger car; a pilot-house will be put at the forward end of the car, and immediately back of that will be two engines 6x12. Back of these will be a 10-feet boiler, 62 flues, and in the rear of that will be the passenger apartment. There will be four bob sleighs on which the car will rest—two at each end—with 15 feet space between the forward and rear bobs. In the center of the car will be a wheel, something similar to a cog-wheel, which will cut the ice and thus propel the machine. A wheel will be in the rear to steer it by some means we did not learn. They seem to be sanguine that they can make the thing work. It will require the ice, we should presume, to be quite smooth and even, to run this car, and although we hope they may make it work, yet we think we won't take passage on the first trip."

Mr. Norman Wiard constructed a similar car many years ago. In Russia, an English-built locomotive, weighing 12 tuns, ran regularly on the rivers, transporting goods and passengers. The cylinders were 10 inches diameter and 22 inches stroke. The drivers were 5 feet, shod with steel spurs. The general construction was the same as any other locomotive except that the forward truck was removed, and a sled placed underneath the boiler.—Eds.

The Philadelphia Photographer.

This is one of the most elegant and pleasing specimens of the typographic art ever issued, and it is as truly excellent in its contents as it is handsome in its appearance. It contains a large amount of original photographic information by the best writers upon the subject. Every number is also embellished with a fine photographic picture. The number for January contains a photograph done at night by means of the magnesium light. We see that the editor is laboring under the effects of bromide of potassium. He says it was a bitter pill. No doubt, as it seems to have been a full dose. Benerman & Wilson, Publishers, Philadelphia. $5 a year.

THE total area of the United States and its territories is 3,230,572 square miles.

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VOL. XIV., No. 4...[NEW SERIES.]..*Twenty-first Year.*

NEW YORK, SATURDAY, JANUARY 20, 1866.

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Every man who has money to invest always desires to place it where it will make the best return. This being admitted, we undertake to say that $3, invested in the SCIENTIFIC AMERICAN, will return three-fold in the amount of valuable information which its columns supply. Mechanics, inventors, manufacturers, farmers—as well as every head of a family—will get, on an average, $10 worth of information from a year's number of this journal, and yet they can get it for the low sum of $2 50, in clubs of ten names.

Talk about high prices—here is something cheap enough to stop the mouths of all grumblers. Only think of it—a large volume of 832 pages, full of costly engravings, for $3, and less to clubs. If any of our readers think we can get rich at such prices, let them try the experiment. Send in your clubs and subscriptions.

CONCERNING BELTS.

In other parts of this paper our readers will find some thing of interest relating to belts. One is a communication from a Mr. W. Annan, of Illinois, on lacing, and the other an invention to facilitate the process. Certainly nothing can be of greater importance to manufacturers than belts, and all relating to them, for there is not a factory in the land, of any size, but has thousands of feet in daily use. Further, they are costly to replace, and careless or ignorant persons frequently destroy them by misuse.

Great remissness in lacing belts and laxity in the matter of inspecting them frequently, to see if they need repair, is noticeable. We have seen large machine shops stopped for hours while the main belt was being laced, and it is nothing uncommon for half or three-quarters of an hour to be wasted in stretching or putting in rivets, when the same ought to have been attended to over-night, or, at the least, during noon hour.

Manufacturers know very well that half an hour deducted from the labor of a machine amounts to a large sum, where there are many machines, and when these petty losses are easily avoided, there is certainly no excuse for their occurrence. Some man of experience should be paid extra to lace the belts whenever they need it. Let him make it his business to inspect them regularly, and be held accountable for their failure, if it appears that his neglect was the cause. This relates, of course, to the principal driving belts, for on the individual machines each workman ought to take care of his own.

The ends of a belt should always be cut off square, not guessed at by the eye, but laid off with a tool. The holes ought to be made with a small punch at a proper distance from the end—the size of the holes and the distances of them depending on the width of the belt. The use of an awl is reprehensible, for the holes are apt to be made irregular by it, and much larger than there is need of. The end of the lace should be tied with a square knot in the middle of the outside, for the corners of the belt where it is cut are most exposed and apt to whip out. Tieing a belt lace does not look so neatly as where the ends are put through an incision, but tieing saves the belt from having extra holes made in it. The laces ought to be of the same thickness from end to end, or as nearly so as possible. It often happens that laces have very thin spots in them; such should be kept for short belts, and never used for long ones. Moreover, the holes must be made at equal distances apart and not too many of them; every hole weakens the belt, and none that are not absolutely essential should be cut. All new laces, as well as new belts, should be stretched by hanging weights on them before they are used—petroleum, sawdust, resin, and similar substances should never be used. When a belt gets harsh or dry, neat's-foot oil is the best thing to apply to it.

A LARGE STEAM CYLINDER.

Not very long since, a steam cylinder six feet in diameter was regarded as something extraordinary, and many sagacious and experienced mechanics doubted whether any larger would ever be made. With years, however, came increased knowledge, and engineers were found bold enough to project engines with cylinders over 100 inches in diameter. Mr. Erastus W. Smith was the first engineer, in this country, to build large beam engines; the *Metropolis*, of the Fall River line, having an engine with a cylinder 105 inches in diameter, and twelve feet piston stroke. When this cylinder was cast at the Novelty Works, some six or eight years ago, it was considered an event. A horse and cart were driven through it lying on its side, and a collation was served in it to show its huge dimensions. After that many steam cylinders were cast of nearly the same size.

Recently Mr. Smith has designed some beam engines much larger than any now afloat. In point of piston area they are only surpassed by some screw engines in the British navy, which have cylinders 112 inches in diameter, and 48 inches piston stroke.

The engines alluded to are for a new steamboat company, formed to run vessels on the Sound between this city and Bristol, R. I., and the large cylinder belonging to one of the engines was successfully cast at the Etna Iron Works of Mr. John Roch, in this city. Its diameter internally is 110 inches by 12 feet piston stroke, and the weight is 18 tuns. The net length is 13 feet 8 inches, and the steam port is 60 inches by 12 inches. The walls of the cylinder are about 2½ inches thick. The casting is one of the handsomest we have ever seen; it was superintended by Mr. William Gaynor, the foreman of the foundery.

The condenser for these engines is of the surface variety, and is a bulky affair, exceeding the cylinder in weight and dimensions. It is a rectangular body, 12 feet wide, 9 feet high and 18 feet long, and weighs 23 tuns. The average thickness of the walls is 1¾ inches. This would make a room much larger than an ordinary parlor, and far more commodious than the little dens called rooms in watering-place hotels. We shall give fuller and further details of these engines at an early day.

DEATH OF PROFESSOR MAPES.

Professor James J. Mapes died in this city on the 10th of the present month, in the 60th year of his age. Professor Mapes was born in New York and passed most of his life here, though for the last 17 years he had been cultivating a large farm with signal success in New Jersey. This farm was considered the model farm of the country, and was made so by the management of its owner; though a barren sand plain in 1848, it is said to have yielded recently a revenue of $20,000 per year.

Professor Mapes, like many Americans, tried various pursuits. In the course of his life he was in turn a trader, a sugar refiner, an editor, a farmer and a lecturer; and he made a number of valuable inventions. He was appointed Professor of Chemistry by the American Institute, and lectured on the science before that association. From want of early and systematic education, his statements were not always to be received without examination, but from the natural clearness of his intellect he had a faculty of stating what he did know that might well have excited the envy of many more learned men. With the single exception of Dr. Lardner, we never heard a speaker who was so lucid as Professor Mapes. In the useful labor of making science popular his ability was unsurpassed. He was a genial man, full of wit and humor, and through a very wide circle of acquaintances and friends his death will be sincerely mourned.

OUR POSITION ON THE EXPANSION QUESTION

We have many thousand new subscribers, and from communications received from some of them, we perceive that our remarks, in relation to the *Algonquin* and *Winooski* trial, have given the impression that we are advocates of Mr. Isherwood's theories, and that we do not believe in the economy of working steam expansively. Both of these notions are incorrect, as all our old subscribers and readers know.

We have repeatedly stated that we have no doubt of the economy of working steam expansively—that the most economical measure of expansion depends on the pressure of the steam, the extent to which it is superheated, the perfection with which the cylinder is jacketed, the velocity of the piston, and several other circumstances, including even the temperature of the atmosphere in which the engine is operated. In order to ascertain the most economical measure of expansion by experiment, we should want all the conditions to be as nearly alike as possible, except the point of cut-off. In the *Algonquin* and *Winooski* trial, one engine was run with 20 lbs. pressure and the other with 70, the steam in one being cut off at $\frac{1.3}{10.0}$ths of the stroke and in the other, at $\frac{6.2}{10.0}$ths. No human intelligence could ascertain whether any difference in the results would be due to the difference in the pressure or the difference in the expansion. A costly experiment conducted in this way seemed to us ridiculous.

On page 244, Vol. XI., we published an elaborate article on the theory of expansion, in which we expressed our dissent from the notion of Mr. Isherwood, that steam in expanding without doing work would be partly condensed. We stated that as the total heat of high-pressure steam is greater than that of low-pressure steam, expansion, where no work is done, should be accompanied by superheating.

In reply to this article Prof. W. J. Macquorn Rankine, of Glasgow University, sent us a communication in which he indorsed our position in opposition to that of Mr. Isherwood. As Prof. Rankine is the highest authority in the world in this department of physics, and as his statement of the law of expanding steam contains more matter in relation to the subject than was ever before expressed in the same number of words, we publish his communication for the benefit of our new subscribers.

TO THE EDITORS OF THE SCIENTIFIC AMERICAN:—

Gentlemen,—

As I see that in the SCIENTIFIC AMERICAN of the 15th of October, you make some reference to a work of mine, I beg leave to make the following remarks on the subject of your article.

The circumstances under which steam undergoes expansion may be classed under five heads:—I. When the steam expands without performing work. II. When it expands and performs work, the temperature being maintained constant by a supply of heat from without. III. When it expands and performs work, being supplied from without with just enough of heat to prevent any liquefaction of the steam, so that it is kept exactly at the saturation point. IV. When it expands and performs work in a non-conducting cylinder. V. When it expands

and performs work in a conducting cylinder, not supplied with heat from without.

I. When steam expands without performing work (as in rushing out of a safety-valve or through a throttle-valve) it becomes superheated, as is well known; the temperature falling very slightly in comparison with the boiling-point corresponding to the diminished pressure. The precise rate at which the temperature falls is not yet known; but it will probably be soon ascertained through some experiments by Prof. Thomson and Mr. Joule.

II. When steam expands and performs work, the temperature being maintained constant by supplying heat through the cylinder, the law of expansion at first deviates from Marriotte's law by the pressure falling *less rapidly* than the density; but as the expansion goes on, the law approaches more nearly to that of Marriotte, as recent experiments by Messrs. Fairbairn and Tate have shown.

III. When the steam expands and performs work, *being maintained exactly at the temperature of saturation*, the law of expansion—as you observe, is perfectly definite. In the treatise to which you have referred I have shown what it is; and also that it is expressed nearly enough for practical purposes by taking the pressure as being proportional to the 17th power of the 16th root of the density; a function very easily calculated by means of a table of squares and square roots. In many actual steam engines the circumstances of this case are practically realized, as is shown by the agreement of their performance with the results of calculation.

IV. When steam expands and performs work in a non-conducting cylinder, it was shown by Prof. Clausius and myself, in 1850, that the lowering of the temperature, through the disappearance of heat in performing work, goes on more rapidly than the fall of the boiling point corresponding to the pressure, so that part of the steam is liquefied. This result was experimentally verified by Mr. G. A. Hirn, of Mulhouse, a few years afterward (see his Treatise on the Mechanical Theory of Heat). The mathematical law of the expansion in this case can be given with perfect precision; but its circumstances are not accurately realized in practice, because the cylinder is always made of a rapidly-conducting material.

V. "Lastly, when the steam expands and performs work in a conducting cylinder, which receives no supply of heat from without, but is left to undergo a great alternate rise and fall of temperature through its alternate connection with the boiler and the condenser, the law of expansion becomes very variable, and the problem of determining it extremely complex. It is certain, however, that a great waste of heat occurs in every case of this kind, as Mr. Isherwood's experiments have shown. In a paper read to the Institution of Engineers in Scotland, about two years ago, I discussed some of Mr. Isherwood's earlier experiments, and showed that they gave proof of a waste of heat increasing with the fall of temperature due to the expansion of the steam, with the extent of conducting surface of the cylinder, and with the duration of the contact between the hot boiler steam and that conducting surface."

As to the value of indicator-diagrams, I have always held that they gave a good approximation to the whole *work done* by the steam during each stroke, though not to the pressures at particular instants, which, in ordinary indicators, are affected by oscillations and other disturbing causes; but that defect I consider to be nearly, if not entirely overcome in the indicator of Mr. Richards; and I hope for very valuable results from the extension of its use.

W. J. MACQUORN RANKINE.

Glasgow University, Nov. 18th, 1864.

RIPPING SUTURES IN CLOTH.—Messrs. J. Pullar & Son, proprietor of the Mill-street Dye Works, Perth, Scotland, write to us for information concerning F. B. Converse's patent for the instrument above. They wish to correspond with the patentee.

AMERICAN PHOTOGRAPHIC ALMANAC.—This is an excellent little work, full of most useful information for photographers, by Prof. Towler. Every photographer should have a copy. 50 cents. J. H. Ladd, No. 88 Write street, N. Y.

ISSUED FROM THE UNITED STATES PATENT-OFFICE

FOR THE WEEK ENDING JANUARY 9, 1865.

Reported Officially for the Scientific American.

☞ Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying size of model required and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

51,908.—Steam Water Elevators.—John B. Atwater, Chicago, Ill.:

First, I claim the construction and arrangement of the within-described apparatus for elevating water from wells, by the direct application of steam upon a body of air which is compressed within a chamber above a column of water, said apparatus being so constructed that it will automatically refill itself with water when the pressure of steam is removed, substantially as described.

Second, In an apparatus constructed and arranged as herein described, I claim forming a communication, C, between the chambers, a b and B, which is of less diameter than the said chambers, for the purpose of presenting as small a cooling surface as possible to the steam, substantially as described.

Third, In an apparatus constructed and operating substantially as herein described, I claim arranging the discharge end of the pipe, C', in such relation to the valve, c2, that steam will impinge thereupon as it enters the chamber, c, substantially as described.

51,909.—Composition for Razor Strops.—Frank R. Atwood, Lowell, Mass., and Abm. Elston, Port Jervis, N. Y.:

We claim a paste made of the ingredients herein specified, with or without neatsfoot oil, substantially as set forth.

51,910.—Pipe Coupling.—E. Barbaroux, Louisville, Ky.:

I claim a soil or driving pipe for oil and other deep wells, whose sections are united to each other substantially in the manner and for the purpose above described.

51,911.—Hollow Auger.—Fordyce Beal and Major Smith, New Haven, Conn.:

We claim the combination of the slide, I, with the cutter, D, constructed and arranged to operate substantially as and for the purposes specified.

Second, The arrangement and construction of the cutter, D, adjusting screw, b, and set screw, d, combined so as to operate for the purpose of increasing or diminishing the depth of cut of the auger.

51,912.—Salinometer.—Benjamin F. Bee, Hardwick, Mass.:

First, I claim the combination of the closed vessel for containing the water to be tested, and the instrument for testing it, the same being subject to the boiler pressure.

Second, The arrangement for adjusting and retaining the water line in sight, by the compression of the air contained in the cylinder, B, and tube, C.

Third, The arrangement of the valve, e, and its appendages, when used for the purpose as set forth.

51,913.—Tank for Preparing Peat.—Albert Betteley, Boston, Mass.:

I claim the construction of the tank with the provision for separation of water from the peat, substantially as set forth.

Also combining with a tank so made the screw, c, for discharging the prepared peat, substantially as set forth.

51,914.—Medical Compound.—George B. Bieler, Cincinnati, Ohio:

I claim the compound of ingredients for purposes as specified.

51,915.—Rope Machine.—John Blackie, New York City:

First, I claim the stationary reel or bobbin holder, G, provided with the slotted plate, m, and adjustable arm, i, mounted upon the hollow journals, within the revolving frame, I, as shown and described.

Second, In combination with the stationary reel, G, the main frame, A, and the inner frames, I, arranged to revolve in opposite directions, substantially as set forth.

Third, the combination and arrangement of the operating wheels, B C D and E, main frame, A, inner frames, I, and reels, G, operating in connection, as described.

Fourth, In combination with the main frame, A, of the right and left handed screw, R, arranged to operate in connection with the wheels, T, as shown and described.

51,916.—Horse Shoe.—John H. Brown, Watertown, Minn.:

I claim the tapering grooves in the heel portions of the shoe, formed in the manner and of the shape described, in combination with the short tapering section of india-rubber, as and for the purpose set forth.

51,917.—Plow.—Oscar F. Burton, New York, and Lora B. Holt, Cedar Falls, Iowa:

First, I claim making the mold board of a plow entirely of glass, substantially as and for the purpose described.

Second, The combination of clamps, c d, and V-shaped grooves, a b, for the purpose of attaching the mold board, D, without bolts or screws, substantially as and for the purpose set forth.

51,918.—Window Sash Fastener.—E. Calderwood, Portland, Me. Antedated Jan. 3, 1866:

I claim the metallic strip, r, inserted within the side of the sash frames, o, in combination with a thumb screw, v, all being arranged together and operating substantially as herein described and for the purpose specified.

51,919.—Mode of Sinking Wells.—J. C. Campbell and M. V. Campbell, Syracuse, N. Y.:

We claim the combination of the conical pointed plug, B, strainer, C, and pipe, A, as and for the purpose set forth.

51,920.—Heddle Eyes for Loom Harness.—John L. Cheney, Lowell, Mass.:

I claim the improved heddle eye made substantially as described, viz., of one piece of wire bent into the form exhibited in Fig. 1, and with its extremities arranged at the junction of two of the loops, and having solder or brazing applied to the said junctions and to the said extremities, as specified.

51,921.—Hot-air Furnace.—John Chilcott, Brooklyn, N. Y. Antedated Dec. 28, 1865:

First, I claim the arrangement, substantially as herein described, of two or more tiers of flues, a a, forming one continuous series, through which the gaseous products of combustion from any suitable fireplace circulate one after the other, and a series of intervening, separate, and independent air passages, heated by the said flues.

Second, The construction of said continuous series and intervening air passages, in slabs or plates, C D, D E, in which each of the said flues and air passages are half in one and half in the next slab, a plate above or below it, substantially as herein described.

51,922.—Flues and Setting of Open Boilers.—John Chilcott, Brooklyn, N. Y., Antedated Dec. 25, 1865:

I claim the combination, for heating a melting pan, kettle, or open boiler, of a series of flues running back and forth under the bottom of the said pan, kettle, or boiler, and a series of flues surrounding the same, the whole forming a continuous system, through which there is a circulation from the furnace or fireplace to the chimney or uptake, substantially as and for the purpose herein specified.

51,923.—Furnace for Steam Boilers.—John Chilcott, Brooklyn, N. Y. Antedated Dec. 28, 1865:

First, I claim the slab, F, arranged across the ashpit, C, below the grate, B, substantially as and for the purpose herein specified.

Second, The arrangement of the opening, e, passages, f g, h, and opening, i, in combination with each other and with the furnace and slab, F, substantially as and for the purpose herein described.

Third, The arrangement of the opening, k, passages, l l m n, and orifices, p p, in combination with each other and with the furnace and ashpit, substantially as and for the purpose herein specified.

51,924.—Shutter Fastening.—Eli Cole, Tarrytown, N. Y.:

I claim the combination of the box, a, catch, e, and catch, f, all arranged with reference to the sash, D, and blind or shutter, C, substantially as set forth, for the purpose specified.

51,925.—Well Drill.—Adam G. Coles, Mamaroneck, N. Y. Antedated Jan. 3, 1866:

First, I claim the construction of a drill for drilling or boring oil or other artesian wells, or other drilling operations in the earth's crust, with a central cutter and a surrounding series of reversible movable radial cutters, substantially as herein specified.

Second, The combination of the dovetail-headed cutters, a d a d, the longitudinal grooves in the stock, the surrounding collar, B, and the key, f, substantially as and for the purposes herein set forth.

51,926.—Clasp for Leather Straps.—Alonzo B. Conde, Albany, N. Y.:

I claim the clasp formed and operating as described and for the purposes set forth.

51,927.—Railroad-station Indicator.—Alexander S. Cox, Washington, D. C.:

First, I claim the combination of a rectilinear reciprocating draw rod, D, which is provided with a rack, r, the spur wheel, f, pawl, s' f', and ratchet wheel, g, with the band roller, B, and cylinder, C, the whole operating substantially as described.

Second, Providing the station indicator with a rectilinear draw rod, D, which is acted upon by a spring, s, and adapted for actuating the mechanism that moves the band, a, substantially as described.

Third, The combination of the band roller, B, and winding-up cylinder, C, with brake straps, c c', and a tension adjuster, substantially as described.

Fourth, The studded ratchet wheel, g, in combination with the stop pawl, J, and the belt roller, B, substantially as described.

51,928.—Fancy Loom.—George Crompton, Worcester, Mass.:

First, I claim the construction of the vertical heddle levers, having slots or mortises with pins passing through them, for the support of the double hooks, as described.

Second, The construction of the loop, with its spur-like branch, attached to the extremities of the vertical levers, as described.

Third, The construction and combination of the two pairs of oscillating levers, 21, 21 and 24 24, and their respective bars, 27 and 26, forming the lifter, depresser and eveners, with the hooks, and pattern cylinder or chain, as described.

Fourth, So constructing the bearings of the rod, 39, that it may be raised and return to its original position, substantially as and for the purpose set forth.

51,929.—Roll for Pressing, Sizing, and Calendering Paper.—Francis Curtis, Malden, Mass.:

First, I claim as a new manufacture the employment of hard rubber rolls in pressing, calendering and sizing paper.

Second, As a new article of manufacture, I claim pressing, calendering and sizing rollers to be used in the manufacture of paper when made of hard rubber or of iron, or any other material covered with hard rubber.

51,930.—Self-acting Mule.—Lorenzo C. Dam, Lowell, Mass., and John Wigley, Milford, N. H.:

We claim the expansion drum, formed by the cone and hinged arms, or their equivalents, substantially as herein described and for the purpose specified.

We also claim the combination of the expansive drum with the scroll cam, T, and the pulley, K, or their equivalents, by which the velocity of the cylinder that drives the spindles is increased or diminished as required.

We also claim the combination of the faller wire and the attached nippers with the band pulleys, screw, Y, and lever, 19, or their equivalent, for moving the cone, S, to the right or the left at the right time, and to such a distance as may be necessary to impart the requisite velocity to the cylinder, 46.

51,931.—Inkstand.—Samuel Darling, Bangor, Maine:

I claim the combination and arrangement of the open cavity, c, the projection, b, and the circular groove, d, with the pen passage or tube, a, the ink reservoir, A, and the base, B, when such base and reservoir are made and applied together with inclined surfaces at their junction, arranged in manner and so as to operate substantially as described.

I also claim the arrangement of the vent hole, e, in the upper part of the supply tube or dipping cup, in manner and for the purpose specified.

51,932.—Shuttle-box Motion in Looms for Weaving Figured Fabrics.—Christopher Duckworth, Mount Carmel, Conn.:

First, I claim the pawl lever, J, suspended in front of the cam, h, in combination with the hooked arms, c c1 c2 and c3 c4 c5, substantially as described.

Second, Attaching the hooked arms, c c', or their equivalents, at different distances from the axis of motion of their oscillating lever, F, substantially as described.

Third, Arranging hooked arms, which are indirectly connected to the pin cylinder, or its equivalent, so as to be operated by it in such manner that a vibrating pawl lever, J, will operate upon all of them at proper times, substantially as described.

Fourth, The combination of the hooked arms, c c', oscillating arm, F, and a pattern governing device, substantially as described.

Fifth, Pivoting the cam rods, G G', to arms, F' F, the movements of which are controlled by a pin cylinder, or its equivalent, substantially as described.

51,933.—Animal Trap.—John H. Elward, Polo, Ill.:

I claim the combination of the revolving lever with a revolving stop, when arranged and operating substantially in the manner and for the purpose described.

51,934.—Telegraph Insulator.—A. B. Ely, Boston, Mass.:

First, I claim the hard-rubber or gutta-percha cap, having its lower edge in the form of a bead and terminating in a flange or disk bent inward toward the hook, substantially as and for the purpose described.

Second, The combination of two caps with the hook, substantially in the manner and for the purpose described.

51,935.—Insulating Telegraph Wires.—A. B. Ely, Boston, Mass.:

First, I claim insulating telegraphic wires, or their supports, with the material applied, in the manner substantially as and for the purposes set forth.

Second, The new article of manufacture herein described, constituting an insulated wire, made substantially as described for the purposes set forth.

51,936.—Rotary Pump.—Wm. Foster and Robert Foster, Brooklyn, N. Y.:

First, We claim the adjustable head, E, in combination with the cylinder, A, piston wheel, B, and sliders, D, substantially as and for the purpose set forth.

Second, The combinations of the set screws, a, and tubes, b, with the adjustable head E, and with the cylinder head and piston, substantially as and for the purpose specified.

Third, the V-shaped adjustable strips, c, in combination with the sliders, D, of the piston wheel, substantially as and for the purpose described.

51,937.—Manufacture of Fire-proof Safes.—Samuel T. Fowler, Brooklyn, N. Y.:

First, I claim the new article of manufacture, consisting of a safe filled with hydraulic cement, as described, for the purpose specified.

Second, Preparing the cement to fill the safe, as aforesaid, by mixing it with hot water, as set forth.

51,938.—Wagon Box.—William B. Geer and Almond H. Palmer, Portland, Ill.:

I claim the arrangement of the various portions of our machine for the purposes set forth.

51,939.—Bolt for Flouring Mills.—Solomon Godfrey, Peoria, Ill.:

I claim, First, Applying a blast of air to the exterior surface of a bolting reel, substantially in the manner described, for the purpose of cleaning the bolting cloth, and cooling the flour.

Second, The combination with a bolting reel of one or more perforated air pipes arranged to discharge the air in jets upon the external surface of the cloth, substantially as described.

Third, The combination with the bolting reel of one or more air pipes capable of turning on their axes to vary the angle at which the blast strikes the cloth, as set forth.

51,940.—Gate.—A. L. Grinnell, Des Moines, Iowa:

First, I claim mounting a gate upon a shaft, so arranged that the gate is opened by turning it up in a vertical or nearly vertical position, and closed by throwing it in a horizontal position.

Second, The combination with each other of the post, A, shaft, E, post, F, uprights, D D', slats, C, braces, G H and I, substantially as shown and described.

[This invention consists in so constructing and mounting a gate upon a rock shaft that the same can be readily opened by throwing it from a horizontal to a vertical position, and thus leave the passage way entirely clear, and which can be closed by again throwing it in a horizontal position.]

51,941.—Mode of Releasing Horses from Carriages.—James T. Guthrie, Leesburg, Ohio:

I claim the double whiffletrees, b, retaining bolt, E, arm, D, spring, c, and strap, F, in combination with cross bar, B, substantially as above described and for the purpose set forth.

51,942.—Currier's Knife.—Joel P. Hawks, Troy, N. Y.:

I claim the above-described currier's knife, consisting of the stock, A, constructed with the above-described projection for holding or receiving the shanks, B B B, the shanks, B B B, provided with screws and nuts for holding or securing in place the jaws, G G', combined and operated in the manner and for the purposes specified.

I also claim the jaws, G G', constructed and arranged in the manner described for the purpose or setting the knives at any desired angle with the stock.

I also claim the shanks, B B B, in combination with the jaws, G G', and stock, A, arranged and operating in the manner and for the purpose above specified.

51,943.—Cutting Uppers for Balmoral Boots.—Horace Hayward, Fitchburg, Mass., assignor to himself and Thomas H. Dodge, Worcester, Mass.:

First, I claim cutting the parts, A B and C, which form the top and sides of the boot, and one side of the leg of a high top balmoral boot, substantially as shown and described.

Second, Cutting the parts, D, to form one side of the leg of a high top balmoral boot, substantially as shown in Fig. 2 of the accompanying drawings.

51,944.—Balmoral Boot.—Horace Hayward, Fitchburg, Mass., assignor to himself and Thomas H. Dodge, Worcester, Mass.:

I claim a high top balmoral boot, the upper and leg of which are cut and made substantially as shown and described.

51,945.—Well-tube Packing.—S. E. Hewes, Albany, N. Y.:

First, I claim a valve constructed and operated substantially as described and so arranged within an oil well as to permit or prevent the downward passage of the surface water, as and for the purpose explained.

Second, I claim the described arrangement of the packing-bag relatively to the water valve and stationary and rotary tubing.

Third, I claim the combination of the coupling, B, valve, b, opening c3, flange, c', and rim, c, substantially as and for the purpose specified.

Fourth, I claim the rim, c, in combination with the retaining annulus, E, the ears, f, and collar, F, for holding the lower end of the packing bag, as explained.

Fifth, I claim the adjustable retainer, G, and annulus, H, in combination with the adjustable supporting collar, a, as and for the purpose set forth.

Sixth, I claim an adjustable collar, a, arranged upon a well tube, when used to sustain a movable packing, substantially as described.

51,946.—Apparatus for Carbureting Air.—E. S. Hutchinson and H. L. McAvoy, Baltimore, Md.:

First, We claim a close casing of any form, suitably subdivided and adapted to force and carburet air by its rotation and the gravity of the liquid.

Second, We further claim the air box, H, constructed and employed substantially as and for the purpose set forth.

51,947.—Hay-loader.—De Witt C. Jewett, Sand Spring, and Asa C. Bowen, Bowen's Prairie, Iowa:

First, We claim the manner substantially as herein set forth, of working the rake independently of the swinging frame and then working both the rake and swinging frame together, for the purpose set forth.

Second, So applying the rake to a wagon, and controlling its operation that the hay may be raked and lifted from the ground and carried from one end of the wagon to the other, or to any point between the two ends of the wagon, substantially as herein described.

Third, The arrangement of the several parts, substantially as described, whereby the rake and swinging frame are operated by the direct pull of the horse or horses attached to the wagon.

51,948.—Electrical Bath Tub.—Jerome Kidder, New York City:

I claim the employment or use of the buoyant electrode, J, in connection with the sliding one, G, arranged as applied to a bath in the manner shown or in any equivalent way for the purpose specified.

I further claim the attaching of the sliding electrode, G, to the conducting wire, a, inclosed within a non-conducting elastic tube, F, which is fitted around pulleys, D E, connected with the bath as shown for the purpose of enabling said electrode to be moved, substantially as set forth.

51,949.—Apparatus for Raising Dough.—Worley Leas, Kakomo, Ind.:

I claim the combination of the dough tray, B, and the steam or water chest, A, substantially as and for the purposes described.

[This invention consists in the construction of a box containing a tray for holding dough, and capable of receiving under it hot water or steam for imparting sufficient heat to cause the dough to raise in a thorough and expeditious manner.]

51,950.—Horse Hay Fork.—David Lippy, Mansfield, Ohio:

I claim the rod, G, provided with a crank, H, to which the tripping rope, I, is attached, and also provided with a lip, e, and attached to the head, A, of the fork, in combination with the bail, E, connected to the arm, C, of the fork head, A, and provided with a rod, c, for the lip, e, of rod, to catch over, all arranged substantially as and for the purpose herein set forth.

[This invention relates to a new and improved hay fork, that class which are used for elevating hay by means of a horse, from a load, and depositing it in mows or barns. The invention consists in a novel and improved tipping device, whereby the load may be readily discharged from the fork at any point in the path of the elevation of the latter, and the casual or accidental tipping of the fork prevented.]

51,951.—Fish Hook.—H. B. Livermore, Ashland, Pa.:

I claim the guard or loop, B, applied to a fish hook, substantially as and for the purpose specified.

[This invention was illustrated in the last preceding number of the SCIENTIFIC AMERICAN.]

51,952.—Railway Signal.—Albert W. Livingston, Sidney, Ohio:

I claim the arrangement of the devices herein described for signalizing the approach of trains, the same consisting of the right-angular lever arms, I L, respectively attached to communicating and signalizing posts, C and S, to the latter, S', of which are connected in a proper manner any desired signal, either flag, lamp, etc., in combination with the hook of locomotive cab, or other suitable device, the whole operating together substantially in the manner specified.

Second, Hanging the cabhooks upon the cab so that they can be thrown out or in the plane of operation at pleasure, substantially as specified.

[To prevent the occurrence of collisions of railroad trains moving in opposite directions upon one and the same track, is the principal object of this invention, and is secured by so arranging at suitable and any desired points upon either or both sides of the track, one or more signals either in the form of lights, lanterns, flags, etc., which signals, by means of a peculiar arrangement of devices operated by the movement of the train over the rails, are caused to be displayed, sufficiently in advance of the train, to warn and thus stop all approaching trains in an opposite direction.]

51,953.—Artificial Leg.—John Madden, Cleveland, Ohio:

First, I claim the strap, m, truss, T, connected to the socket by the jointed plates, S L with the spring in the said joint, or its equivalent, when constructed and arranged as and for the purpose set forth.

Second, I claim the strap, p', catch, P, rack, R and J, when arranged in combination with an artificial leg, and operating substantially as and for the purpose set forth.

Third, I claim the rod, D, joint, c, roller, e, and strap, e', in combination with the spring, f, slide, r, and leg, substantially as and for the purpose set forth.

Fourth, I claim the tension rod, H, and spring, g, in connection with the double ball and socket joint on the plate, P, and cross piece, s, when constructed and arranged substantially as and for the purpose set forth.

Fifth, I claim connecting the sections of the leg together, by means of the rod, D, forming a jointed connection at each end of said rod, when arranged substantially as herein set forth, for the purpose specified.

51,954.—Door Latch.—Emmons Manley, Marion, N. Y.:

I claim the slotted latch, A, with the pivoted tumbler, B, cam, D, and stop, m, constructed and arranged as set forth.

51,955.—Propellor.—Joseph T. Martin, New York City:

First, I claim, in propellers which operate by means of buckets or floats, which are alternately opened and closed by the resistance of the water, changing the direction in which the buckets open and close by means of vibrating bars, P, carrying a transverse frame, Q, which arrests the buckets, substantially as above described.

Second, I also claim the triangular buckets, T, in combination with the conical bucket frame, O, within which they swing, substantially as above described.

Third, I also claim the detent carriages, U, carrying detents L and M, at opposite ends, in combination with the racks, K, and cords, I J, substantially as above described.

Fourth, I also claim the detent carriages, U, in combination with the vibrating bars, P, which carry the transverse frame, Q, substantially as described and shown.

51,956.—Pneumatic Spring for Cars.—John Merlett, Bound Brook, N. J. Antedated Dec. 25, 1865:

First, I claim the construction of a pneumatic spring with an annular air chamber, A2, surrounding and communicating at the bottom with the cylinder, A, in which the plunger or its equivalent works are separated from the said plunger by an interposed column of liquid, substantially as and for the purpose herein specified.

Second, The cap, b3, attached to the plunger, B, and combined with the external cylinder, A, of the annular air chamber to form a guide for the said plunger, substantially as herein specified.

51,957.—Folding Lunch Box.—J. A. Minor, Middletown, Conn.:

First, I claim the combination of the side, D, of a folding lunch box, with the cover, B, and bottom, E, by hinging the said cover and bottom to the upper and lower edges of said side, substantially as described and for the purpose set forth.

Second, The combination of the ends, F and G, of a folding lunch box, with the side, D, by hinging the said ends to the end edges of said side, substantially as described and for the purposes set forth.

Third, The combination of the side, H I, made in two pieces, hinged together with the ends, F and G, by hinging the said side to the said ends, substantially as described, and for the purpose set forth.

[This invention consists in hinging the top, bottom, and both ends of the box to one of its sides, the other side being made in two parts hinged to each other and to the ends, thereby furnishing a convenient box which may be readily and compactly folded.]

51,958.—Washing Machine.—Hiram Nash, Cincinnati, Ohio:

I claim the combination of the longitudinal bars, D D, springs, h h, and friction rollers, f f, with the traveling rubber, when so arranged as to produce pressure on said rubber, in all positions, substantially as set forth.

I also claim, in combination with the traveling rubber, c, thus arranged, the arrangement of the jointed double-connecting rods, i i', and double levers, G G', in such a manner that the rubber may be operated by a joint action either at the end or side of the machine, as described.

I also claim forming the rubber, c, in a segment of a cylinder, and so arranging it in combination with the bed, B, that it may be turned up at each end for the reception or removal of the clothes, and without removing it from the receptacle, or depressing the levers, substantially as described.

I also claim the special construction and arrangement of the operating parts of the machine, the same consisting of the rubber, C, rollers, f f, bars and springs, D h, connecting rods, i i', and levers, G G', the whole operating substantially in the manner and for the purpose herein set forth.

51,959.—Breech-loading Fire Arm.—F. D. Newbury, New York City. Antedated Dec. 28, 1865:

I claim the plate, P, shaped as described, and sliding between the barrel and frame or stock of the piece, for the purpose of locking them together during the act of firing, and of removing the empty cartridge shell from the barrel by the movement of the barrel as it is turned upon the frame, in order to make room for another cartridge, substantially as the same is set forth and described in the within specification.

51,960.—Press for Striking up Metal.—John North, Brooklyn, N. Y.:

First, I claim the combination of the stationary collar, Y, movable plug or shaft, W, cam, S, and adjusting screw, V, all constructed, arranged and operated in the manner set forth.

Second, In combination with the above, I claim the punch, A2, constructed and operating as described.

Third, I claim operating the punches, A2 and W, by means of the cam, S, constructed and arranged substantially as described.

Fourth, The cam plate, S, hollow plug or shaft, provided with a follower or ejector, operated by the curved arm of said cam or its equivalent, arranged and connected together and with the driving power used substantially in the manner described, and so as to operate with regard to the fixed collar of the machine as and for the purpose specified.

51,961.—Wrench.—T. C. Page, Holyoke, Mass.:

I claim securing the auxiliary serrated jaw to either the stationary or sliding jaw of a screw wrench or to the bar thereof, in the manner substantially as above described.

51,962.—Cotton Gin.—S. R. Parkhurst, Bloomfield, assignor to Emily R. Parkhurst, N. J.:

First, In combination with mechanism for ginning cotton, I claim broadly, automatic mechanism for removing from a mass of cotton a supply of cotton and seeds to be transferred in a regular manner to the ginning mechanism for the purposes and substantially as set forth.

Second, In combination with a ginning mechanism, I claim a feeding cylinder or surface armed with teeth, to take the cotton gradually from a hopper and convey it to a position for delivery to the ginning cylinder, substantially as specified.

Third, I claim the combination of the following four devices, first, a ginning cylinder, second a feeding surface armed with teeth to take the cotton from the mass in the hopper, third, the stripper or equivalent mechanism to keep the surplus cotton in the hopper, and fourth, a brush or cylinder to transfer the cotton from the feeding surface to the ginning cylinder, substantially as set forth.

Fourth, I claim the combination of a feeding cylinder or surface armed with teeth, a ginning cylinder, and a revolving stripper to remove the seeds from the cotton, substantially as specified.

Fifth, I claim a pair of condensing cylinders formed of gauze or finely perforated surfaces, and sustained by vertical shafts, substantially as specified, so that the fiber shall be delivered from a vertical opening and pass away in the form of a loose silver or roving as set forth.

Sixth, I claim the perforated cylinders, u u, on vertical shafts in combination with the trunk, x, through which the blast of air is conveyed away as set forth.

51,963.—Lifting Jack.—S. J. Parmele, Killingworth, Conn.:

First, I claim the shde, F, in combination with the lifting lever, D, and locking bar, E, substantially as and for the purpose specified.

Second, I claim the combination of the catch bar, C, and spring, e, with the rack bar, A, and lifting lever, D, and locking bar, E, substantially as shown and described.

[This invention consists in the employment, in connection with the lifting bar and locking bar of a carriage jack, of a slide of peculiar construction, whereby the adjustment or locking of the lifting bar is greatly facilitated.]

51,964.—Broom Head.—George W. Parsons, Harrisburg, Pa.:

First, I claim the employment of corrugated metal plates for broom heads, substantially as and for the purpose set forth.

Second, The combination of the corrugated plates and the taper sliding clamps, substantially in the manner and for the purpose set forth.

51,965.—Pumps.—F. S. Pease, Buffalo, N. Y.

First, I claim the combination of the float on the water in the pump stock, or in a chamber connected therewith, with the necessary connecting portions, such as the rod, the rocking arm, V, and the rod, Q, and the clacks or either of them, which regulate the passage of the air through the pipes, D and E, which connect with the vacuum and pressure chambers respectively.

Second, I claim the vertically elongated pump nozzle, G, in combination with the float, K.

Third, In combination with the rotary valve as described, I claim the combination of the cock, T, with the pipe, F, for shutting the compressed air in said well pipe for the purpose described.

51,966.—Lantern.—George Pengeot, Buffalo, N. Y.:

I claim carrying the wire guards over and crossing them directly above the glass globe and in contact therewith or nearly so, as shown at F, and fastening the ends thereof at the base as shown at g, so as to protect and hold the glass in place as set forth.

51,967.—Compasses and Callipers.—Frank P. Pleghar and William Scholihorn, New Haven, Conn.:

I claim the combination of the beveled segment, D, and the key, a, with the leg, A, of compasses and callipers, constructed and arranged to operate substantially in the manner and for the purposes specified.

51,968.—Boot and Shoe.—J. C. Plumer, Boston, Mass. Antedated Dec. 26, 1865:

First, I claim a boot or shoe, constructed with the inclinations of the upper or treading surface of the sole, as described.

Second, The depressions, G L, as described.

Third, The surfaces as described in combination with the depressions as described.

Fourth, Constructing a boot or shoe having a sole with the inclinations of surface and the depressions as described.

Fifth, A boot or shoe with the inclinations and depressions of the treading surface of the sole as and for the purposes described.

51,969.—Horse Rake.—Stephen B. Reed, Stuyvesant, N. Y.:

First, I claim the combination of the levers, e e, with the rectangular supports, B B, hinged to the axle, D, and with the shaft of a revolving hay-rake, A, all substantially in the manner and for the purpose herein set forth.

Second, I claim the combination and arrangement of the auxiliary stay levers, r r, with the operating levers, e e, and the revolving rake, A, substantially in the manner and for the purpose herein set forth.

51,970.—Belt Stretcher.—Seymour Rogers, Pittsburgh, Pa.:

First, I claim the combination of the eccentric rollers, C and D, with the square shafts, K and J, substantially as described and for the purpose set forth.

Second, The combination of the roller, I, with the end pieces, G and H, ratchet wheel, L, and pawl, M, substantially as described and for the purpose set forth.

Third, The combination of the rope, N, or its equivalent with the end pieces, F and E, and rollers, I, substantially as described and for the purpose set forth.

[This invention furnishes an exceedingly useful implement for drawing the ends of belts together to be sewed or secured to each other. Each part of the instrument is attached to an end of the belt by eccentric rollers, the parts are connected together by cords or chains, and by turning a crank these cords or chains are wound up and the ends of the belt drawn together, where they are held by a pawl and ratchet wheel, until they have been secured after which the instrument is readily removed from the belt.]

51,971.—Life Preserver.—Emile Rousseil, West Newark, N. J.:

I claim a life preserver constructed of two hollow drums or floats, with openings to receive valuable papers or documents, and with depressions, d, to receive the straps, c, in combination with the body belt, B, shoulder straps, C, and pocket, g, intended to receive a single flag, D, substantially as and for the purpose described.

[This invention consists in a life preserver composed of two hollow drums made of tinned sheet iron or other suitable material, and provided with openings through which valuable papers and other articles can be introduced, and which can be hermetically stopped up by a cork or other means in combination with a body belt to which said drums are attached, and which is supported by suitable shoulder straps, one of which is provided with a pocket to receive a signal flag, in such a manner that in case of accident on board a vessel, the life preserver can be securely strapped to the body of a person, and all danger of displacement is avoided.]

51,972.—Calculating Machine.—Newton Rowland, Hilltown, Pa.:

I claim the arrangement of the machine consisting of the revolving graduated toothed disk, operated by the arm and spring pawl, the intermediate stationary annulus, and the outer graduated and revolving annular plate, upon whose face the valves of the inner revolving disk are centuplicated as described and represented.

[This invention consists in the use of a horizontal circular disk graduated upon its upper face into one hundred equal parts, numbered from one to one hundred inclusive, arranged so as to be revolved at pleasure, and placed and moving around within an outer stationary concentric ring, similarly graduated and numbered, but in the opposite direction to that of the disk, in combination with a horizontal revolving ring, divided into one hundred equal parts, numbered by the hundreds from one hundred to ten thousand inclusive, which ring is so constructed and connected, through suitable mechanical devices, with the revolving

disk that upon every complete revolution of the same, it shall by moved one division or one-hundredth of its circumference.]

51,973.—Locks.—James Sargeant and H. W. Covert, Rochester, N. Y.:

We claim the combination and arrangement of the bit, b, and cam, 1, with the tumbler, E, pivoted directly to the bolt, B, in such a manner as to transfer the throwing action from the dog and notches, substantially as herein specified

We also claim making the brakes that secure the center of the wheels, with long arms p p, having a proper degree of elasticity, and employing in combinatio therewith the double faced cam, r, the whole so arranged as to avoid rigidity of the parts, and holding them securely in place, substantially as described.

We also claim in combination with cams, r r, of suitable form for securing the centers of the permutation wheel in place and with a suitable key, G, for turning the cams, the shoulders, b' c, forming stops for limiting the motion of the key, substantially as and for the purpose herein set forth.

We also claim adjusting the length of the shaft, D, to adopt it to the doors of different thickness, by means of the longitudinal notch, f', and the cap, g, substantially as described when the same are used in combination with the mechanism of a lock.

51,974.—Trusses.—John Scott, Ocalo, Florida:

I claim attaching each end of the band, B, and one end of the strap, C, to the face plate of the pad by a single pivot, substantially as and for the purpose described.

51,975.—Harvester.—M. R. Shalters, Alliance, Ohio:

First, I claim the vibrating frame, H H, constructed and arranged as set forth, carrying the crank shaft, I, and suspended from the main frame, A A, by the arms, e, and J, by pivots in the line of the axis of the secondary shaft extended, and retaining the pinion, g, in gear with the spur wheel, F, in any position of the vibrating frame.

Second, I claim the cam, B, and link, r, in combination with the way, m', when arranged and operating conjointly, substantially as and for the purpose set forth.

51,976.—Portable Gas or Petroleum Cook Stove.—Hamilton E. Smith, Cincinnati, Ohio:

First, I claim the arrangement of a series of lamps or burners of which part are shiftable, in the described combination with an oven, G, having side flues, H H', discharging in its upper part and one or more heat inlets, C C', at its lower part for the purposes set forth.

Second, The arrangement of stand, A, and its described accessories adopted for optional baking or boiling, and conversion to the use of movable lamps or ordinary gas burners in the manner set forth.

51,977.—Washing Machine.—A. J. Stafford and S. Crossman, Essex, N. Y.:

We claim the frame, J, with the rubber shaft, K, attached in connection with the driving wheel, H, and roller, I, or equivalent gearing, and the crank, f, provided with a wrist pin, l, which in an oblong vertical slot in the outer end of frame, J, all arranged substantially as shown and described to give a circular reciprocating motion in the rubber, M.

We also claim the attaching of the bar, C, to which the driving wheel, H, is connected to the tub, A, by means of a joint or hinge and the connecting of the board, F, to said bar, C, for the purpose of admitting of the ready adjustment of the rubber in the tub admits withdrawal therefrom, substantially as set forth.

We also claim the combination of the tub, A, rubber, M, frame, J, and the rubber driving mechanism composed of the wheel, H, roller, I, or equivalent gearing and the crank, j, provided with the wrist pin, K, fitted in the slot, l, of frame, J, all arranged to operate substantially as and for the purpose set forth.

[This invention relates to a new and improved clothes-washing machine of that class in which a rubber having a circular reciprocating motion is used in connection with a tub. The invention consists in the peculiar means employed for giving motion to the rubber, and also in connecting the rubber and its driving mechanism to the tub, whereby the rubber may be operated with the greatest facility, and with but a moderate expenditure of power, and the rubber very readily removed out from the tub and an justive therein, and also with its driving mechanism readily detached from the tub whenever required.]

51,978.—Wood Bending Machine.—H. E. Stayer, Milwaukee, Wis.:

First, I claim levers, G G, form, B, bending band, K, adjustable end pressure block, M M, and rubber springs, N N, combined substantially as and for the purpose described.

Second, Bending band, K, adjustable end pressure blocks, M M, and rubber, spring, N N, in combination as and for the purpose described.

51,979.—Device for Forming Horse Shoes.—U. Stewart Berlin, Wis.:

I claim the convex and grooved surface anvil, A, to be used in the manufacture of horse shoes by hand, substantially as described.

51,980.—Drill Head.—William W. St. John, Syracuse, N. Y.:

I claim a drill head provided with apertures constructed as described and with external corrugations arranged in the form of a eat hand screw, substantially as set forth.

51,981.—Bed Bottom.—Joel E. Todd, Middletown, Conn.:

I claim the combination of the spring with the spindle, s, and disk, c, when the said disk is separate from said spindle, substantially as and for the purpose specified.

51,982.—Sash Fastener.—Richard Vose, New York City:

I claim the construction and arrangement of a hinge or jointed swinging pawl, G, and spring, F, in combination with rack, H, rod or chain, E, and angular lever, A, substantially in manner and for the purpose herein set forth.

51,983.—Sash Fastener.—George W. Wareham, Dayton, Ohio:

I claim the arrangement of the plate, a, the lever, b, the catch, c substantially as described.

51,984.—Suction Drill.—Owen G. Warren, New York City. Antedated Dec. 26, 1865:

I claim exhausting the comminuted stone and dirt from a well through a pipe, in the process of boring, in the manner substantially as described.

51,985.—Revolving Fire-arm.—Eli Whitney, New Haven, Conn.:

First, I claim a perforated shield, or breech cap, which is provided with flanges that serve as anvils and cartridge extractors, in combination with a hollow tube or spindle passing through the revolving cylinder, B, and a locking contrivance which connects the shield and cylinder together, in such manner that they will revolve together, substantially as described.

Second, Attaching the hollow spindle or tubular axis of the shield or breech cap to the revolving cylinder, B, in such manner that in unloading the shield and cylinder will not be detached from each other, substantially as described.

Third, The flanged shield, C, in combination with a tubular spindle, which is secured to it, substantially as described

Fourth, A shield, C, which combines in its construction ratchet teeth, exploding anvils, and cartridge retractors, in combination with a revolving chambered cylinder, and a locking pin or its equivalent, substantially as and for the purpose described.

Fifth, To constructing the shield, C, and applying it to the cylinder, B, that it will serve as a cartridge extractor, and also afford anvils for the explosion of the metallic cartridges, substantially as described.

Sixth, The combination of the flanged shield, C, revolving cylinder, B, tubular spind e, K C, and transverse recesses, a a, in the frame, A A', all operating substantially in the manner and for the purpose described.

51,986.—Horseshoe Nail Machine.—James A. Whitney, Maryland, N. Y.:

First, I claim the die faces, a1 a2 and a1 c2, placed opposite each other, substantially as shown, and used in connection with any suitable device for turning the nail rod, all substantially as set forth, for the purpose specified.

Second, I claim the combination of the holder, s, chisel, h, and spring, l, for gaging the blanks, as described.

Third, I claim cutting the finished nail from the nail rod by means of a knife or chisel attached to the hammer, when done automatically and without stopping the hammer, substantially as herein set forth and shown.

51,987.—Portable Head Rest.—J. M. Whithey, Boston, Mass.:

First, I claim the combination and arrangement of the said clamp, D wedge, C, and cam lever, E, with the standard, A, and head rest, B.

Second, I claim the combination and arrangement of the adjustable guard, E', with the said clamp, D, and its lever, E, or the same and the wedge, C, when applied to a head rest for carriages, as herein mentioned.

Third, I claim the combination of the guard, E', clamp, D, and lever, E, with the standard, A, and head rest, B, the whole being substantially as hereinbefore described.

51,988.—Mode of Obtaining Silk from Living Spiders and Other Silk Producers.—B. G. Wilder, U. S. Army, and Wm. Nichols, Boston, Mass.:

First, We claim the drawing and reeling or winding the silk directly from the insect, spider, silk worm, or other silk producers, as set forth.

Second, We claim the drawing, reeling, and spinning or turoting together, directly from the bodies of insects, spiders, silk worms, or other silk producers, two or more strands or threads, as set forth.

51,989.—Boring Wells.—Wm. W. Winter and Stephen Brewer, Cortlandville, N. Y.:

First, We claim the construction of bored or drilled wells, in such a manner that the lateral apertures in the lower portion of the pipe or tube shall be closed while the pipe or tube is being sunk in the ground, and readily unclosed or opened when the same has reached its final position in the earth, all substantially as herein shown and described.

51,990.—Packing Pump Pistons.—Marinus N. Allen, Titusville, Pa., Joseph Rouse and James Melcher, Waterbury, Conn.:

First, We claim, in the described combination with a pump piston, the expanding packing, E, confined at its ends in the manner described, so as to avoid any external edge projecting at right angles to the motion of the shaft.

Second, We also packing the pistons of pumps by means of a cylinder confined at its upper and lower ends, whose sides are expanded by fluids or liquids let in between it and the inclosed sides of the piston, substantially as described.

51,991.—Breech-loading Fire-arm.—Hiram Berdan (assignor to the Berdan Fire-arms Manufacturing Company), New York City:

First, I claim the employment, in a breech-loading fire-arm, of a device so applied and operated as to press back the cartridge against the face of the breech, preparatory to firing, substantially as and for the purpose herein described.

Second, So applying and operating the cartridge shell retracter of breech-loading fire-arms that it shall serve the purpose of pressing back the cartridge against the face of the breech, preparatory to firing, substantially as herein specified.

Third, So arranging the detonating pin of a breech-loading fire-arm that it shall strike the back of the head of the cartridge opposite to where it is supported by a movable device which serves the purpose of pressing back the cartridge against the breech, substantially as herein set forth.

Fourth, The elongation of the hole provided in the swinging breech for the reception of the pin upon which it swings, whereby the breech has a direct rear support in the breech receiver at the time of firing, and yet is free to swing back loosely to open the barrel for reloading, substantially as herein set forth.

Fifth, The relative position and arrangement to e ch other of the hammer, firing pin, swinging breech, and line of bore, by which the line of bore is unobstructed, and the loading facilitated when the hammer is at half cock, substantially as herein described.

Sixth, The combination with one main spring of two or more stirrups, one or more connecting the tumbler or hammer, and the other connecting a brace for locking the breech when the hammer is down, substantially as herein set forth.

Seventh, I claim, in combination with a swinging breech piece, the employment of a suitable projection on the lower and front side of the brace or tumbler, whereby the loading at full cock is prevented, substantially as and for the purpose herein specified.

Eighth, So constructing and applying a brace to a swinging breech for breech-loading fire arms, which swings on a rumbler shaft detached from the tumbler, but attached to the main spring in such a way as to give a greater motion to the brace than is given to the tumbler.

Ninth, So combining a movable brace which operates to lock the breech at the time of firing, a three-notched tumbler, and a swinging breech, in a breech-loading fire-arm, that while the hammer is locked by the sear in the first or safety notch, the breech is locked in a closed condition by the said brace, substantially as herein set forth.

Tenth, The combination of the flanges, breech receiver or lock frame, A, the pins upon which the hammer, breech, and sere work, and the subsidiary pieces of the stock by which the pins are held in place, substantially as herein described and for the purpose herein set forth

51,992.—Flour Sifter.—A. E. & J. B. Blood, Lynn, Mass., assignors to themselves and E. D. Goodrich, Cambridge, Mass.:

First, We claim the combination of the finely-perforated concave or sieve, A, and levers, G G, constructed with oblong slots, J J, and with a pressure device, M, or its equivalent, substantially in the manner and for the purpose described.

Second, Arranging the scrapers, K, and rollers, M, at the bottom of the levers, G G, in oblong slots, or in slots somewhat larger than the ends of said scrapers, and rollers, substantially as and for the purpose described.

Third, Providing the bottom of the scrapers, k, with a strip of leather or other suitable yielding material, substantially as and for the purpose described.

Fourth, The revolving cylinder or cylinders, M, when combined with a sieve and operating with a rolling pressure upon the flour, which is placed upon said sieve to be sifted, substantially as and for the purpose set forth.

Fifth, The arrangement of the reflectors, D, in combination with the concave sieve and pressure device, G G M, or its equivalents, substantially as and for the purpose set forth.

51,993.—Shoe Jacks.—Thomas L. Brown (assignor to George W. Foster, Cincinnati), Ohio:

I claim a last holder provided with two sets of rotary shifting plates, A B, connected by a tightening bolt, F, parallel to both and eyeleted to receive unadjustable terrestrial cord or thong, J, or devices, substantially equivalent, connected and operating substantially as set forth.]

51,994.—Reed Musical Instruments.—Riley Burdett (assignor to Jacob Estey & Co.), Brattleboro', Vt.:

I claim the improved manner of marking reed boards in instruments of music, so that the third and fourth sets of reeds rest on the same base as the first and second sets, all being equally near to the valve.

51,995.—Molder Clamp.—John B. Crowley (assignor to himself and Chamberlain & Co.), Cincinnati, Ohio:

I claim the use of the shoe, D, in connection with the hook, B, and cam-headed lever, C.

51,996.—Rotary Steam Engine.—Wm. Goodwin, (assignor to himself and Wm. H. Holland), Boston, Mass.:

I claim the arrangement of the two sets of inlet and outlet ports, a b, the annular eduction passage, L, and the reversing valve, N, with the chamber, K, the angular cylinder, B, the wheel, C, piston, D, and gate, E, the whole being to operate together substantially as hereinbefore specified.

I also claim the combination as well as the arrangement of the beveled tappet wheels, U V W, and the main valve, P, and its cheat, O, with the shaft, D, and the rotary engine made and applied to such shaft, substantially as above described, the two steam chests, O K, being connected by a conduit, R, as explained.

51,997.—Manufacture of Enameled Cloth.—William H. Haines (assignor to John McLorinan), Newark, N. J.:

I claim as a new article of manufacture an enameled cloth, made substantially in the manner described.

51,998.—Varnish for Enameling Cloth.—Wm. H. Haines (assignor to himself and John McLorinan), Newark, N. J.:

I claim a varnish made of two or more substances, or admixture in the nature of a varnish of an independent and different amount of drying property, so that when admixed and used together the surface of the varnish, when dry, will present a series of chrystalizations or corrugations, substantially in the manner and for the purposes described.

51,999.—Apparatus for Turning the Leaves of Music.—George M. Hopkins (assignor to himself and W. R. Smith), Albion, N. Y.:

First, I claim in an apparatus for turning the leaves of music, ke ping the fingers, which engage the leaves, in an erect position by means of springs which act against eccentrics or cams formed on the fingers at the places where they are pivoted to the swinging arms, E, substantially as above described.

Second, I also claim the detaining rod, F, in combination with the finger, D, substantially as described.

Third, I also claim the supplementary arm, H, with its finger piece, I, and finger, J, by means of which the whole series of arms, E, can be turned back at once, and the first page or leaf of music can be re-opened by means of finger, J, substantially as shown and described.

Fourth, I also claim the manner, substantially as above shown and described, of applying the springs, N, to the arms, E, and arm, H, in combination with the means of adjusting said springs, through the agency of rod or pin, Q, clamp, F, and fulcrum-plate, O, as above set forth.

Fifth, I also claim the lifter or escapement, C, applied and operated, as shown, in combination with the latch, L, substantially as above described.

52,000.—Cork-cutting Machine.—Alex. Mackie (assignor to Borie & Mackie), Philadelphia, Pa.:

First, I claim the sliding plate, C C', with the spindles, Q Q', combined with the within-described devices, or their equivalents, and with the revolving knife, X, so that a block of cork will be seized between the two spindles, carried to the knife, X, revolved while in contact with the same, and afterwards withdrawn, all substantially as described.

Second, The cam plate, M, combined with the sliding plates, C C', and the within-described devices, or their equivalents, for operating said plates, so that the movements of the latter may be regulated, substantially as and for the purpose specified.

Third, The slotted rod, L, with its springs, f f, and sliding block, b, combined with the wheel, G, and its pin, d, so that the forward movement of the rod may be arrested without interfering with the movement of wheel, G, for the purpose specified.

52,001.—Apparatus for Removing Cargoes of Vessels.—James Manderson and Samuel Favinger (assignors to James Manderson), Philadelphia, Pa.:

First, We claim the bucket, M, and belt, h, combined with the the truck, W, and bar, l, the whole being arranged and operated substantially as and for the purpose set forth.

Second, The combination of the truck, W, with its lever, K, and pulley, I, the inclined rails, c, plate, D', belt, h, and bucket, M, the whole being arranged and operating substantially as and for the purpose specified.

52,002.—Spring for Trusses.—James H. Parker, Trenton, N. Y., assignor to himself, James T. Hall and Isaac Pierce, Floyd, N. Y.:

I claim a truss or supporter spring which will become pliable by heat, and adjust itself to the form of the body to which it is applied, said truss or supporter spring being made entirely of vulcanized rubber or gutta-percha, substantially as herein described and set forth

52,003.—Device for Separating Shot.—U. Anthony Shaw (assignor to Gardner Willard, Lewis Colwell, and Joseph Colwell, New York City:

First, I claim a series of revolving screens for assorting the shot in combination with the inclines and receptacles, substantially as specified.

Second, I claim the method herein specified of assorting shot, and delivering the different sizes into receptacles, by mechanism, substantially as specified.

Third, I claim the combination of a series of inclines for separating the imperfect shot, as set forth, with a series of screens, for assorting the size of the shot, all constructed and arranged substantially as set forth.

52,004.—Shingle.—Joseph Sherman (assignor to himself and John T. Severns), Burlington, N. J.:

I claim a shingle having on its upper surface rounded or sharp-edged ribs, arranged longitudinally, as and for the purpose herein set forth.

52,005.—Railroad Chair.—James W. Sutherland (assignor to himself, John B. Lord, and Samuel C. Frink), Indianapolis, Ind.:

I claim a wrought-iron chair constructed in one piece, substantially as set forth, in combination with a rail notched in the manner and for the purpose set forth.

52,006.—Steam Gage.—Joachim J. Ducomet, Paris, Empire of France:

First, I claim the metallic cap, A, constructed and arranged substantially as and for the purposes described.

I also claim the joint of said cap by which it is securely affixed to its seat, so as to prevent its being torn away therefrom by the internal pressure of the steam, as specified.

I also claim the spring, constructed and arranged as herein described, whereby to prevent the friction wear and tiring thereof, so that the pressure of the steam shall be thereby constantly and correctly indicated.

I also claim the combination and arrangement of the connecting rod, b, crank, f, and spring, l, to regulate the motion of the hand, k, as above set forth.

I also claim the several parts of the steam gage included in the above-enumerated claims, and their connections combined, substantially as and for the purposes specified.

53,007.—Cigarette Machine.—Leopold Kraus and Alexander Szigettry, Mischkolz Kashau, Hungary:

We claim the combination of the tubes, C, x, and w, with the tube and mouth-piece, A and B, when constructed and arranged in the manner and for the purpose substantially as described.

52,008.—Cleaning Cotton and other Fibrous Substances.—Edward Lord, Todmorden, England:

First, I claim the longitudinal grate bars marked S. in Figs. 1 and 2, forming the grid between the beater and the perforated cylinders of a blower or scather, for cleaning cotton and other fibrous substances.

Second, Dividing the feeding trough or concave plate over which the fleece of fibers passes to the beater, licker-in, or other revolving drum or roller of machines used in preparing cotton and other fibrous substances into two or more parts, as described.

Third, I claim supporting the feeding-trough or concave plate, over which the fleece of fibers passes to the beater, licker-in, or other revolving drum or roller, on a fulcrum or center, and weighing it, whether such feeding-trough or concave plate be made in one piece or divided into two or more parts, as described.

52,009.—Apparatus for Ventilating Railroad Cars.—H. Jones Ruttan, Coburg, Canada West. Patented Jan. 9, 1866:

First, I claim the arrangement of the inlet and exit chambers, b, d and c, with the water-tank at the ends of the car, as and for the purpose described.

Second, I claim the combination of the chambers, b, d, divided by a partition, and their lower portion forming a tank, as described.

Third, I claim the mode of withdrawing the impure air by openings in the floor, leading to an upcast shaft delivering above the roof.

Fourth, In combination with the shafts, b, d, I claim the tubular warming stove, arranged substantially as described and represented.

51,508.—(Previously Suspended).—Apparatus for Boring Wells.—Charles Batchelier, Keeno, N. H., assignor to himself, Edwin Parks, Winchendon, Mass., and John R. Sherman, Adams, Mass. Patented Dec. 12, 1865:

I claim the sugar, A, in combination with a slotted well-tube, B strainer, E, and outer casing, D, substantially as described.

REISSUES.

2,144.—Power Press.—Charles W. Johnson, Waterbury, Conn. Patented Nov. 7, 1865:

First, I claim the combination described of the gear, I, and plate, F, or their equivalent, constructed and arranged to operate together substantially as and for the purpose specified.

Second, The combination of the cam, S, lever, N, and bolt, x, in the manner substantially as and for the purpose specified.

Third, The combination of the bolt, r, and lever, N, or their equivalents, substantially in the manner specified, as and for a cut-off, or stop motion.

2,145.—Stone Breaker.—Eli W. Blake, New Haven, Conn. Patented June 15, 1858:

I claim, First, The combination in a stone-breaking machine of the upright convergent jaws with a revolving shaft and mechanism for imparting a definite reciprocating movement to one of the jaws from the revolving shaft, the whole being and operating substantially as set forth.

Second, The combination in a stone-breaking machine, of the upright movable jaw, with the revolving shaft and fly wheel, the whole being and operating substantially as set forth.

Third, In combination with the upright converging jaws and the revolving shaft, imparting a definitely limited vibration to the movable jaw, set arranging the jaws that they can be set at different distances from each other at the bottom so as to produce fragments of any desired size.

EXTENSIONS.

Instrument for Cure of Stammering.—Robert Bates, Pa. Patented Sept. 30, 1851. Extended Sept. 29, 1865:

I claim, First, The employment of a tube in the mouth which will admit of speaking, and the passage of air when either the tongue or lips would prevent the passage of air substantially as hereinabove set forth.

Second, The employment of the adjustable spring pad, substantially as hereinabove set forth.

Third, The joint employment of the mouth tube, and the adjustable spring pad, at the same time curing the guttural, lingual and labial disease of stammering, substantially as hereinabove set forth.

Machine for Sawing Volutes.—Elijah Whiten, Hingham, Mass. Patented Sept. 30, 1851. Extended Sept. 29, 1865:

I claim the manner in which I produce the two motions necessary to be given to the block in order that it may be sawed in the required form, viz. the screw rod, F, and its right and left screws cut upon it meshing into the pinions, t t', by which motion is communicated to the horizontal rods, G G', the toothed wheels, pinions or spurs, u u, grasping the edge of the block and causing it to rotate in combination with the bevel pinions, l m, screw rods, k, and arm, o, by which a rectilinear motion toward the saw is given the carriage and block, producing the result described.

Machinery for Enameling Moldings, Etc.—Robert Marcher, Cornwall, N. Y. Patented Oct. 21, 1851. Reissued March, 15, 1859. Extended Oct. 21, 1865:

First, I claim in coating or enameling the surface of moldings, the employment of a plate whose lower edge is formed the reverse of the transverse form of the molding to which it is applied, when such plate is made self-adapting to the surface of the molding during the longitudinal movement, substantially as herein described and for the purpose set forth.

Second, I claim the employment of a hopper to contain the composition for enameling when the lower edges of the end plates thereof are formed the reverse of the transverse form of molding, and the molding to be enameled is employed as the bottom of such hopper, substantially as described, and for the purpose set forth

Machinery for Shaving, Nicking and Reshaving Wood Screws.—Thomas J. Sloan, New York City. Patented Oct. 21, 1851. Extended Oct. 21, 1865:

I claim so combining the shifting mandrel that carries the blanks with a shaving and nicking apparatus substantially as described, that the blank after being shaved to give the required form to the head, and while held in the same mandrel, may be shifted to the nicking apparatus, and after being nicked, reshifted back to the same shaving apparatus to have the burrs removed by the same cutter that performed the first shaving operation, as herein set forth.

I also claim the employment of two shifting mandrels, substantially as specified, in combination with the shaving and nicking apparatus, substantially as herein described, so that the nicking operation can be performed on one block, while the first and second shaving operations are being performed on other blanks as specified.

I also claim giving to the mandrel or mandrels, end play in the boxes in combination with the permanent rest at the back of the mandrel and with the cutter, substantially as specified, by means of which the same position of the blank relatively to the cutter is obtained for the second shaving operation, which it had for the first as described.

Oil Presses.—David Louis Latourette, of St. Louis, Mo. Patented Oct. 28, 1851. Extended Oct. 28, 1865:

I claim the combination of the heating plates with the steam chamber, substantially as herein set forth, the plates being moved parallel, and the steam tubes connecting them with the steam chamber sliding in stuffing boxes in a line with the motion of the plates as above set forth, said steam chamber being placed in proper relative position with the plates for that purpose.

Tanner's Oil from Rosin.—Louis S. Robbins, New York City. Patented Nov. 4, 1851. Extended Nov. 4, 1865:

I claim the new and original products of manufacture which I denominate, Robbins tanner's oil, or Robbins currier's oil, the process of producing which I have herein fully set forth.

Lubricating Oil from Rosin.—Louis S. Robbins, New York City. Patented Nov. 4, 1851. Extended Nov. 4, 1865:

I claim the new and original product of manufacture which I denominate, Robbins lubricating oil, the process of producing which I have herein fully set forth.

Distilling Acid and Naphtha from Rosin.—Louis S. Robbins, New York City. Patented Nov. 4, 1851 Extended Nov. 4, 1865:

First, I claim the process of separating the acid and water, arising from the decomposition of rosin, at the temperature of 525, degrees fahrenheit, or thereabout by means of fire heat, substantially in the manner herein set forth.

Second, I claim in combination with the above, the process of separating the naphtha from the other components parts of the rosin by preserving the temperature of the liquid mass within the still at about the range of 525 degrees fahrenheit, as above stated, and injecting steam into the same, by which I am enabled to throw off the naphtha at the same temperature employed for throwing off the acid.

Third, I do not intend to limit my improved process of distillation as hereinbefore described to the production of oil from rosin, but shall employ it for redistilling the crude article known as rosin oil.

Stove-grate Bars.—Philo P. Stewart, Troy, N. Y., assignee of George W. Gardner, Albany, N. Y. Patented Nov. 18, 1851. Reissued May 31, 1864. Extended Nov. 18, 1865:

First, I claim the detaching of cinders, clinkers or ashes from coals or solid burning fuel, by means of parallel grate bars having an oscillating or vibrating motion in the horizontal plane imparted thereto by means of a frame or yoke, and lever or equivalent therefor, in the manner substantially as herein described and set forth.

Second, I also claim the employment of parallel grate bars, so constructed, arranged, and combined with a frame or yoke, as to be operated or vibrated in a horizontal plane by means of a lever, substantially as herein described and set forth.

Railroad Car Brakes.—Francis A. Stevens, Chicago, Ill. (formerly of Burlington, Vt.) Patented Nov. 25, 1851. Extended Nov. 25, 1865:

I claim the combination and arrangement of the levers, links, rods, and shoes or rubbers, substantially as herein described, whereby each wheel of both trucks of a car is retarded with a uniform force, when the brake is put into operation.

Drop Press.—Milo Peck, New Haven, Conn. Patented Nov. 25, 1851. Extended Nov. 25, 1865:

First, I claim the general arrangement and combination of the crank and shaft with the sweeps, moving always in the same direction with the moving gear or pulley, and the ratchet wheel jointed together and running loose upon the shaft, constantly in the same direction, substantially as I combine them, for the purposes herein describe).

Second, I also claim the lock in combination with its sweep and springs, and with the crank to stop its motion not too abruptly, and to lull it until it is unlocked by the hand or foot of the workman, substantially as described.

Machinery for Making Kettles and articles of like character from Disks of Metal.—Hiram W. Hayden, Waterbury, Conn. Patented Dec. 16, 1851. Extended Dec. 16, 1865:

First, I claim the application of a rotary metallic form or mold, or successive forms or molds, in combination with a proper tool or tools, roller or rollers, sustained, moved and directed in a proper path by competent mechanical means, for the purpose of operating on a disk, blank or plate of metal, so as to reduce it gradually from the center to the edge, at the same time forming it with straight sides, by successive stages, into a complete kettle, or into any similar articles, to the forming of which this apparatus can be applied, substantially as described and shown.

Second, I claim the construction of the mandrel, f 3, part of which is cylindrical, and part fitted with a short screw, 13, to take the screws of the hand wheel, f 2, so that great pressure may be made at the point desired, while at the same time the mandrel can be easily and quickly moved through a long distance for the purposes as described and shown.

Grain Sieve.—Rebecca C. Wheeler, administratrix of Thomas B. Wheeler, deceased. Albany, N. Y. Patented Dec. 16, 1851. Extended Dec. 16, 1865:

I claim forming sieves for separating grain from straw chaff, and all extraneous matter, and for other analogous purposes, of sheet metal, with apertures, B B, cut or otherwise made in it, and inclined leaves, A A, under the said apertures, of corresponding form with the apertures themseves, substantially as herein set forth.

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——, of Mass.—It is not a new idea to use an air pump to exhaust fruit jars, instead of heat. It has been tried and found not so good as cooking the fruit slightly.

J. S. M., of Me.—Atwood's alcohol is alcohol purified by the improved process of Mr. Atwood, of Boston, Mass. At one time it was used by nearly all photographers, but now there is competition in the market among several distillers.

G. U., of Mass.—Dr. Grace Calvert says that the best material for making cloth or leather waterproof is paraffine with the addition of a "few per cent" of linseed oil. See his statement on page 369 of our last volume.

E. L., of N. J.—Parchment paper, as well as bladder and other animal membrane, is used as a dialyser. This process separates gummy from crystalline substances. As soda and quartz are both crystaline, they would not probably be separated by dialysis. Soluble glass would not be a permanently waterproof coating.

A. H. C.—The treatment of the ends of paper collars as you propose could probably be patented, if the useful result which you describe is really obtained.

P. D. says:—"I see that Canadians are not allowed to participate, on equal terms, in United States patent-law protection. Will you please inform me through the SCIENTIFIC AMERICAN whether mere residence in Canada constitutes such a Canadian as is contemplated by the statute, and so much obliged?" ANS.—No. But if you are residing in Canada you will have to make oath that you are not a citizen thereof, and otherwise swear yourself out of all connection with that patent-benighted Government.

M. H. S., of N. J.—The French meter contains 39·36350535 American inches.

H. M., of C. W.—The notice which you send us of a new mode of refining petroleum has no description of the process; such unmeaning puffs we are always distrustful of.

S. J. H.—The information you desire is contained in the business directory of New York City, J. F. Trow, publisher, No. 50 Greene street.

McL. & G. ask:—"Is a man obliged to show his claim to a patented article, if it is demanded for information?" ANS.—No.

J. H. E.—Combination locks, without key hole, are used upon some safes.

A.—You can purchase books of forms such as you describe in your city.

R. E., of Mo.—The parties you inquire about are responsible.

J. R. M., of Pa.—Fresco painting is executed in mineral colors, ground in water, and laid on the fresh plaster. The plaster should be of fine, pure sand and lime.

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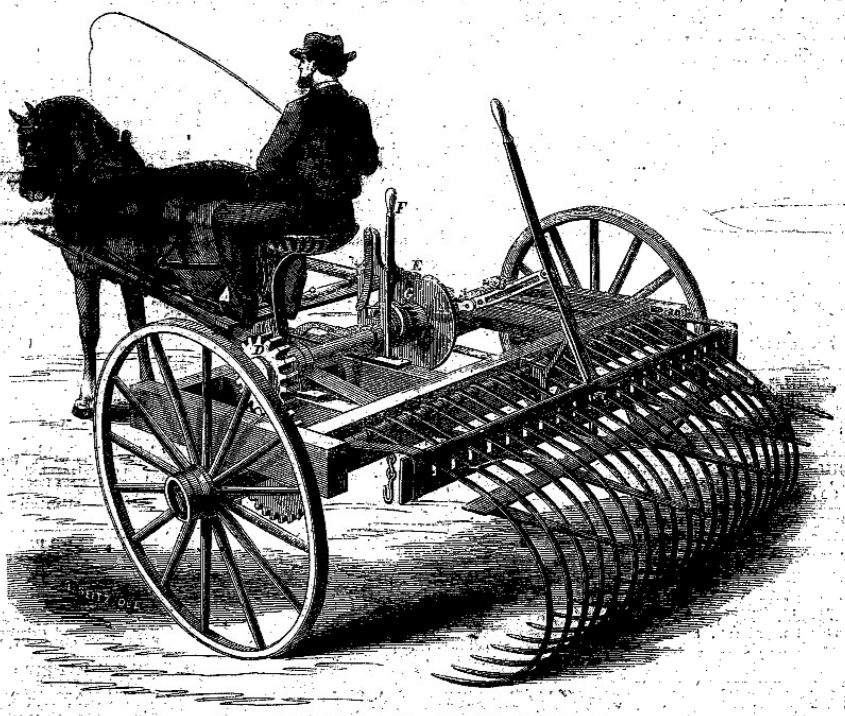
Improved Horse Rake.

The ordinary horse rake is so made that it has to be turned over by hand. At each winrow, the mechanism which prevented the rake from revolving is withdrawn, and thrown in again when the hay is deposited. It has occurred to the inventor of this rake that the machine might be made self-acting, so that no hand labor whatever would be required, and the team merely drawn over the field. In this plan he has succeeded, and the engraving illustrates the means by which the end is accomplished. The details are quite simple, and while the rake is made capable of doing the work efficiently alone, it is readily converted into the ordinary rake, and the load can be discharged at any time or place, as in the old-fashioned machines. The frame of this machine has a shaft and crank wheel, A, which is driven by gearing from the main axle. The crank wheel has a slotted connecting-rod, B, which is attached to the lever, as shown.



ADELSBERGER'S HORSE RAKE.

This lever works on the shaft the rake teeth are attached to, and has a joint, at C, where the teeth pass through the slotted guide. When the team advances, therefore, the crank wheel will revolve, and the rake be caused to move up and down, thus discharging its load without any action on the part of the driver. The time of discharging the hay can be regulated by altering the length of the slot in the rod, so that more play will be given to it before it commences to lift.

When it is desired to use the rake as an ordinary one, the stop, E, is thrown into the crank wheel; this also disengages the coupling, G, from the crank wheel, so that the rotation is stopped; the rake can then be used at pleasure. There are also bars affixed behind, so that the teeth pass by them as they rise, thus preventing the hay from being scattered, and causing it to drop in one place, making a compact winrow. The pedal, H, is for the purpose of depressing the teeth of the rake when desired, and the same may be held up when proceeding to work by the chain, I. This seems to be a well-designed and efficient machine.

A patent was allowed it through the Scientific American Patent Agency, December 29, 1865, to Daniel G. Adelsberger, of Emmetsburgh, Frederick Co., Md. Address him at that place.

RENDERING CLOTH UNINFLAMMABLE.

A correspondent from Danville, N. Y., asks us to tell him what is the best preparation to render cloth incombustible; in reply we must say that we know of no substance that will do this. Cloth may be prevented from burning with flame, but it cannot be protected from destruction by heat; it may be saturated with substances which will render it, under ordinary conditions, uninflammable, but they will not make it incombustible. The substance that has been most used for this purpose is alum, though the tungstate of soda has been highly recommended.

Alum acts in two ways to prevent cloth from burning with flame. It has a strong affinity for organic substances, and when applied to cloth it adheres very firmly to the fibers, partly combining with them, and partly covering them with a film which shields them from contact with the oxygen of the atmosphere. When cloth thus protected is subjected to the action of sufficient heat, it undergoes decomposition, the hydrogen and oxygen are driven off, and the carbon remains, in the form of charcoal or tinder; the cloth is charred. Burning is the combination of some substance with oxygen, and flame is the burning of a gas. The reason why hydrogen does not burn when it is expelled from cloth protected by alum is, it is driven off so slowly that the particles are scattered, and before they come in contact with the oxygen of the atmosphere they are cooled below the temperature at which combination takes place.

Another action of alum in preventing the rapid combustion of cloth, is the cooling effected by the expulsion of the water of crystallization. Alum crystals contain a large portion of this water, which is of course in the solid state, and the first action of heat upon alum is to expel the water of crystallization. In escaping, the water is changed from the solid to the gaseous form, absorbing and rendering latent in the change both the heat of liquefaction, 140°, and the heat of vaporization, 960°, in all 1100°. So long as this change is going on, it tends to keep the cloth cool, and thus to prevent combustion.

Cloth protected by a wash of alum, is, however, merely prevented from burning suddenly with flame; if subjected to sufficient heat, it is completely decomposed and destroyed; though the heat acts only on the portion of the fabric subjected to its influence; it is not propagated throughout the whole mass, as in the case of unprotected cloth.

SPECIAL NOTICES.

Samuel Fox, of Deep Car, near Sheffield, England, has petitioned for the extension of a patent granted to him on the 17th day of May, 1853, for the term of fourteen years from the 6th day of April, 1852, for an improvement in umbrellas and parasols.

Parties wishing to oppose the above extension must appear and show cause on the 19th day of March next, at 12 o'clock, M., when the petition will be heard.

Jonathan S. Turner, of Fair Haven, Conn., has petitioned for the extension of a patent granted to him on the 13th day of July, 1852, for an improvement in alarm clocks.

Parties wishing to oppose the above extension must appear and show cause on the 25th day of June next, at 12 o'clock, M., when the petition will be heard.

Ebenezer W. Phelps, of Elizabeth, N J., has petitioned for the extension of a patent granted to him on the 6th day of April, 1852, for an improvement in moth traps to bee hives.

Parties wishing to oppose the above extension must appear and show cause on the 19th day of March, next, at 12 o'clock, M., when the petition will be heard.

Exceedingly Hard Iron.

Some years ago, M. Gaudin found that by heating iron, tolerably free from carbon, with a small quantity of boron, to a very high temperature, he obtained a product which could not be forged, but which possessed extraordinary hardness. He has now found that an equally hard metal may be obtained by adding to ordinary cast iron, in fusion, phosphate of iron and peroxide of manganese—he does not mention in what proportions. The product cannot be forged, but it casts easily, and is therefore readily applicable to the construction of such machines, or parts of machines, as require in their material extreme hardness rather than tenacity. The metal so produced is, moreover, singularly sonorous, and M. Gaudin, accordingly, proposes it as a material for bells. He finds that a still harder metal is produced by the addition of tungsten—again he omits to say in what amount—to ordinary cast iron. He states that this tungsten iron surpasses everything previously known as a material for tools for cutting rocks, and that crystals of it will cut glass as readily as the diamond.—*London Mechanics' Magazine.*

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